THE INSECT FAUNA OF THE SECONDARY OR MESOZOIC PERIOD,
AND THE BRITISH AND FOREIGN FORMATIONS OF THAT
PERIOD IN WHICH INSECT REMAINS HAVE BEEN DETECTED.

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INTRODUCTION.

It will be unnecessary for me to make any preliminary observations in this Paper as to the importance of an acquaintance with Fossil Entomology, or as to the valuable conclusions bearing upon the geological conditions of the earth in former ages, which may be arrived at from a study of insect remains; such remarks as I had to offer on this subject having already been made in the introductory portion of my first Paper.

In the Secondary Rocks of this country fossil insects have been found far more frequently than in those of either the Recent or Tertiary age, and in some few localities these fossils are, comparatively speaking, abundant.

For such a knowledge as we have of the Insect Fauna of this country during the Secondary Period, we are indebted principally to the Rev. P. B. Brodie, F.G.S., who, as I have before remarked,¹ is the author of the *only*² book on fossil insects, either of this or any other period, which has been published in this country. In the determination of a large number of the insects described and figured in this book, as well as for some important introductory observations therein, Mr. Brodie had the advantage of the assistance of Professor Westwood³ of Oxford.

We are indebted to Mr. Brodie not only for the interesting and valuable work just mentioned, but also for numerous papers on fossil insects, which have from time to time appeared in

¹ See Proc. Geol. Assoc., Vol. v., p. 285.

² "A History of the Fossil Insects in the Secondary Rocks of England." London, 1845: (Van Voorst.)

³ Professor Westwood also contributed an important paper on Fossil Entomology, in the Quart. Journ. Geol. Soc., for 1854. Vol. x., pp. 378-396.

the ¹ "Quarterly Journal of the Geological Society," "The Annals and Magazine of Natural History," "The Proceedings of the Warwickshire Naturalists' Field Club," &c.

Amongst the names of other contributors to our knowledge of fossil *Insecta* obtained from British strata of this Period, I must mention those of Mr. W. R. Binfield,² Mr. H. Binfield, Prof. Morris,³ F.G.S., Dr. Mantell, F.R.S.,⁴ Prof. Edward Forbes, F.R.S., Mr. W. R. Brodie,⁵ Mr. C. Willcox,⁵ the Rev. O. Fisher, F.G.S.,⁵ Captain Woodley,⁵ the Rev. Dr. Buckland, F.R.S.,⁶ Mr. H. E. Strickland, F.G.S., Mr. A. G. Butler, F.L.S.,⁷ Mr. S. H. Scudder,⁸ and Mr. E. T. Higgins.

The British formations of this Period in which remains of insects have been found most plentifully, are the upper series of the Upper Oolite (*i.e.*, the Purbecks), and the Lias and Rhætics. The only other formations of this age in which they appear to have been yet discovered in the United Kingdom, are the Hastings Sands, and some other subordinate members of the Lower Cretaceous or Neocomian system, the Kimmeridge Clay, Oxford Clay (?), Forest Marble, Great Oolite, and the Stonesfield Slate.

Although the presence of insects in marine formations may be accounted for by supposing them to have been driven by the wind into the sea, when in its neighbourhood, or when attempting to cross it, yet, as a rule, where their remains have been detected in abundance in such formations, they may generally be considered as satisfactory evidence that land was not far distant at the time they were embedded; and the abundance of other terrestrial

¹ See "Athenæum," January, 1843. "Proceedings Geol. Soc.," Vol. iii., pp. 134, 135, and pp. 780-782; "The Annals and Mag. of Nat. Hist.," 1843, Vol. ii., p. 480. "Quart. Journ. Geol. Soc.," 1846, pp. 14-16. "Quart. Journ. Geol. Soc.," 1847, pp. 53, 54; Vol. v., pp. 31-35; Vol. ix., 1853 (pp. 51, 52); and Vol. x., 1854 (pp. 475-482). "The 35th Annual Report of the Warwickshire Natural History Society" (1871); and the "Proceedings of the Warwickshire Naturalists' and Archæologists' Field Club," 1874, 1877, and 1878.

² "Quart. Journ. Geol. Soc." Vol. x., p. 171.

³ "A Catalogue of British Fossils." London, 1854.

⁴ "Medals of Creation," Vol. ii., p. 555; and "Quart. Journ. Geol. Soc.," Vol. ii., p. 96.

⁵ "Quart. Journ. Geol. Soc.," Vol. x., *antea cit.*

⁶ "Bridgewater Treatise," Vol. ii., p. 78; and "Phil. Mag.," 1844.

⁷ "Lepidoptera Exotica," pp. 126-8; and "Geol. Mag.," Vol. x.

⁸ "Fossil Butterflies," pp. 90-95 of the "Memoirs of the American Association for the Advancement of Science," No. 1, Salem, Mass., 1875.

remains, usually accompanying these fossils in such formations, leaves but little doubt upon the subject.

One notable exception to this rule is the Continental formation known as the Solenhofen Slate of Bavaria, in which insect remains are said to be mixed up, almost exclusively, with the *débris* of *marine* animals and plants.

Before proceeding to notice in detail the various formations of the Period from which fossil insects have been obtained, I think it may be interesting to call attention to the striking difference in the state of preservation of the insects from British strata of this period, with that of those from one of the most important of the Continental formations, *i.e.*, the Solenhofen Slate.

On the subject of the deposition of the Solenhofen insects, I will quote Dr. Hagen,¹ who observes—"On comparing the insects of Solenhofen and Eichstadt with those of England, there appears, in the first place, a difference which may possibly admit of interesting inferences; the insects of the Bavarian strata are almost universally preserved entire; wings, legs, head and antennæ are in their proper places; most of the *Libellulæ* have their wings expanded. He who has noticed on the sandy shores of the Baltic how depositions of insects are now taking place, will admit that the insects of the Solenhofen strata were already dead when deposited."

"The insects would be, as now, driven by the wind into the sea, thrown on the shore dead or dying, and there gradually covered with sand by the rippling waves. That this process took place gradually and slowly in the Solenhofen strata is evident also from another circumstance; for we frequently find the cavities of insects—the head, thorax and body—filled up with regular crystals of calcareous spar. Hence, the pressure of the stratum overlying the insects must have been very slight, when such delicate parts as the abdominal segments of a dragon fly could oppose resistance for a sufficient length of time to admit of the formation of crystals. Naturally there do occur, here and there, in the Solenhofen strata, impressions of insects obtained in a different way, which admit of the idea of a very heavy pressure from the superincumbent strata; yet these specimens are scarce, and form only a small proportion of the entire number."

Now the state of preservation of fossil insects obtained from

¹ See a paper read by Dr. Hagen before the Geological Section of the Brit. Assoc. at Manchester, Sept., 1861; and see the "Entomologists' Annual," for 1862, pp. 1-10.

British strata of this period is, as Dr. Hagen goes on to observe, in strong contrast to that of the Solenhofen insects. The fossil insects discovered in British formations of this age are seldom entire, and their remains generally consist of single wings, or parts of wings.

The imperfect condition of the English fossils may be accounted for on the supposition that their deposition did not take place in the manner of the Solenhofen insects, but only after they had for a long time been tossed about by storms or other commotions, or remained for years soddening in water.

On the Continent of Europe, so far as present discoveries enable us to judge, insect remains do not, as a rule, appear to have been found in the Secondary Rocks in any abundance; but to this rule the Solenhofen Slate of Bavaria, and the Lias of Schambelen in the Swiss Alps, form a striking exception.

For a knowledge of the fossil Insecta of the Solenhofen Slate, we are indebted chiefly to Professor Germar,¹ Count Münster,² Dr. Hagen,³ and Herr H. Weyenbergh, jun.;⁴ and to Professor Oswald Heer⁵ we owe our knowledge of those from the Lias of the Swiss Alps.

Amongst the names of other students of the fossil Insecta of the Continental European formations of this period, may be mentioned — Schröter,⁶ Schmiedel,⁷ Esper,⁸ Schlotheim,⁹ Van

¹ "Ueber die Versteinerten Insekten des Juraschiefers von Solenhofen," *Isis* iv., pp. 421-424, 1837; and "Die Versteinerten Insekten Solenhofens," *Acta. Akad. Leop. Car.*, t. 19, pp. 187-222, 1839.

² "Beiträge zn. Petref.," t. 5, 1841.

³ See "Ennumération des Odonates fossiles d'Europe," at pp. 356-364 of "Revue des Odonates," by E. de Selys-Longchamps. Liège, 1850. The "Entomologists' Annual," 1862; and "Ueber die Neuroptern aus dem Lithographischen Schiefer in Bayern," "Palæontographica," Vol. x., pp. 96-145, 1861-1863; also "Die Neuroptern des Lithographischen Schiefer in Bayern;" "Palæontographica," Vol. xv., p. 57-96, 1865-1868.

⁴ "Sur les insectes fossiles du calcaire lithographique de la Bavière, qui se trouvent au Musée Teyler;" "Archives du Musée Teyler," Vol. ii., pp. 247-294, Harlem, 1869; and Vol. iii., pp. 234-240.

⁵ See "Die Urwelt der Schweiz" (1865), and a translation of the same into French, by M. Demole; also an English translation by W. S. Dallas, F.L.S., published under the title of "The Primæval World of Switzerland," and edited by J. Heywood, F.R.S. London, 1876.

⁶ "Real und Verbal Lexicon," II., s. 93; III., s. 72, 1779; and "Neue Litteratur und Beitr. zur Kenntniss der Naturwissensch.," T. I, p. 410, 1784.

⁷ "Vorstellung einiger Merkwürdiger Versteinerungen," Nürnberg, 1781.

⁸ "De Animalibus Oviparis," &c., 1783.

⁹ "Petrefactenk," p. 42, 1820.

der Linden,¹ Köhler,² von Buch,³ von Meyer,⁴ Geinitz,⁵ Marcel de Serres,⁶ Bronn,⁷ Pictet,⁸ C. von Heyden,⁹ Giebel,¹⁰ Ch. Brongniart,¹¹ and Winkler.¹²

I will now briefly review, in the descending order of geological succession, the various formations of this period in which insect remains have been detected, and the orders, families, genera and species, to which such remains have been referred.

GREAT BRITAIN.

LOWER CRETACEOUS OR NEOCOMIAN.

In the¹³ Lower Cretaceous or Neocomian rocks remains of insects are extremely rare, and confined, so far as present discoveries enable us to judge, to the lowest members (Weald Clays and Hastings Sands) of the series.

The first discovered fossil insects from the Wealden were found in the neighbourhood of Hastings, by Messrs. W. R. and H. Binfield. They consisted of a few minute elytra of *Coleoptera*, and fragments of *Neuropterous* wings, and were obtained in the courses of ironstone exposed at low water-mark, at a place called the "Govers,"¹⁴ near St. Leonards-on-Sea. Above the course of the ironstone, in a bed of dark-coloured shale, many elytra of *Coleoptera* were found, as well as traces of wings of *Coleoptera*, *Neuroptera* and *Diptera*.

A few fragments of *Coleopterous* elytra have also been discovered

¹ "Mem. Acad. Brux.," Vol. iv., p. 247, 1826.

² Leonhard's "Zeitschr. für Min.," &c., T. 2, p. 231, 1826.

³ "Abhand. Berliner Akad.," 1837.

⁴ See Erichson und Grüber's "Encyclopædie," Sec. 2, xviii., p. 537, 1840; art. "Fossile Insekten aus dem lithographischen Schiefer."

⁵ "Charakteristik der Kreidegebirge," p. 13; and "Grundriss der Vers-teinerungskunde," p. 187, 1846.

⁶ "Géognosie des Terrains Tertiaires," &c., Livre iv., sec. 3, p. 244, 1829.

⁷ "Lethea Geognostica," Vol. i., p. 210, 1835-1837.

⁸ "Traité élémentaire de Paléontologie," Vol. iv., 1846.

⁹ "Palæontographica," Vol. i., p. 99, 1851.

¹⁰ "Fauna der Vorwelt," 1856; and "Zur Fauna des lithographischen Schiefers von Solenhofen," T. 9, pp. 373-388, 1857.

¹¹ "Annales de la Soc. Entomologique de France," 7^e serie p. 217 (1876).

¹² "Catalogue Systématique de la Collection Paléontologique" (Musée Teyler), 1876.

¹³ In this paper I have followed the arrangement of Sir Charles Lyell.

¹⁴ See a paper "On the occurrence of Fossil Insects in the Wealden Strata of the Sussex Coast," by W. R. and H. Binfield, communicated by Professor Morris, in the "Quart. Journ. Geol. Soc.," Vol. x., p. 171.

in the Wealden Marlstone, between Tonbridge and Maidstone, and are alluded to by Dr. Mantell.¹

In the "Quarterly Journal of the Geological Society"² for 1854, Professor Westwood alludes to the discovery³ by the late Edward Forbes, of some traces of fossil insects in the Hastings Series of the Isle of Wight, and of a few doubtful specimens by Mr. W. R. Brodie, in the Wealden of Punfield Bay, Swanage, Dorsetshire.

UPPER OOLITE.

PURBECKS.

In the Rev. P. B. Brodie's interesting work on "The Fossil Insects of the Secondary Rocks of England," the Purbecks are referred to the Wealden formation; but modern Geologists are of opinion that, in consequence of the organic remains discovered therein, the Purbeck series has a close affinity to the Oolitic group, and that it should therefore be considered the newest or uppermost member of that formation, instead of the oldest or lowest member of the Wealden.

The Purbeck Beds are divided by Professor Edward Forbes into the Upper, Middle,⁴ and Lower. It is from the middle and lower divisions that insect remains have been obtained in the greatest numbers. The great majority of these fossils were discovered by the Rev. P. B. Brodie, the Rev. Osmund Fisher, Mr. W. R. Brodie, Captain Woodley and Mr. C. Willcox.

In the "Quarterly Journal of the Geological Society"⁵ for 1846, the Rev. P. B. Brodie recorded the discovery of a few imperfect remains of insects in Purbeck (?) strata in the neighbourhood of Swindon, Wilts.

A large collection of insect remains⁶ was obtained by Mr. P. B. Brodie from the Middle Purbecks of Durl'ston Bay, Dorsetshire. These remains included elytra, bodies and wings of *Coleoptera*, *Orthoptera* and *Diptera*, and portions of the wings of *Neuropterous* insects.

¹ See "Quart. Journ. Geol. Soc.," No. 34, Vol. ii., p. 96.

² Vol. x., p. 378-396.

³ "Quart. Journ. Geol. Soc.," 1853.

⁴ See a paper on "The Dorsetshire Purbecks," by Professor E. Forbes. F.R.S., Brit. Assoc. Edinb., 1850.

⁵ "Quart. Journ. Geol. Soc.," 1846, Vol. iii., pp. 53, 54.

⁶ See "Quart. Journ. Geol. Soc.," 1854, pp. 378, 396.

A large collection of fossil insects was also obtained by Mr. Willcox from the Purbeck beds near Swanage; it consisted of some 60 slabs, each containing a number of remains. Professor Westwood says that the fossils obtained by Mr. Willcox included a very extensive series of elytra of *Coleoptera* (including *Buprestidæ* and *Harpalidæ*), also fragments of the wings of *Libellulidæ*, *Blattidæ*, *Tipulidæ*, &c.

Numerous fossil insects were obtained by the Rev. Osmund Fisher from the Ridgway Quarries (Lower Purbecks), near Dorchester.

The largest collection of insect remains from the Lower Purbecks was made by the Rev. P. B. Brodie. "It consisted," says Professor Westwood, "of 350 small slabs of stone of various sizes. Upon many of them only a single fragment of an insect occurs; but upon a considerable number the remains are very numerous, the fragments being crowded together, and often lying one upon another." These remains included quantities of elytra of *Coleoptera*, and also wings and wing covers of *Neuroptera* and *Orthoptera*, and two wings which were, for some time, supposed to be *Lepidopterous*.

The very fragmentary nature of these remains rendered the identification of the majority of them a matter of impossibility; but from Professor Westwood's paper in the "Quarterly Journal of the Geological Society,"¹ for 1854, and from the list of species in Dr. Giebel's "*Fauna der Vorwelt*,"² some 86 species seem to have been determined, viz:—

<i>Coleoptera</i> ...	... 45 species.	<i>Hymenoptera</i> ?...	2 species.
<i>Orthoptera</i> ...	... 12 „	(very doubtful)	
<i>Neuroptera</i> ...	... 10 „	(supposed) <i>Lepidop-</i>	
<i>Hemiptera</i> ...	... 11 „	<i>tera</i> ? ³ ...	2 „
<i>Diptera</i> ...	... 4 „		

On the subject of these supposed remains of *Lepidoptera*, Mr. Scudder⁴ observes, "I have not been able to find, even with Mr. Brodie's help, the first specimen referred to; but an examination of the original of the latter, proved that while it is unquestionably an insect, it cannot be referred to the *Lepidoptera*. As the figure of the first species clearly resembles, in this particular, the one I

¹ Vol. x., pp. 378-396.

² "*Fauna der Vorwelt (Insecten und Spinnen)*", Vol. ii., pp. 187 and 393-426.

³ "*Quart. Journ. Geol. Soc.*," 1854, above cited. (See note 1, p. 124.)

⁴ "*Fossil Butterflies*" pp. 88 and 89.

have seen, I am forced to the conclusion that neither of these wings is *Lepidopterous*."

The Purbeck strata in the Vale of Wardour in Wiltshire, consist, according to Mr. Brodie, of a series of clays, white limestones, grits, sandstones, coarse blue limestones, and fine white slaty limestone. In this last-mentioned limestone, insect remains have been detected in such abundance that it has been called—both here and in Dorsetshire—the "Insect Limestone." It was chiefly from this Limestone in the Vale of Wardour in Wilts, and the Vale of Aylesbury in Bucks, that the large collections of fossil insects were obtained which furnished materials for Brodie's "History of the Fossil Insects in the Secondary Rocks of England." Out of some 240 specimens, or parts of specimens, from these formations, 74¹ were figured by Professor Westwood in the work last mentioned. The very fragmentary and imperfect condition of a great quantity of the insect remains discovered in these formations rendered it impossible, even for so experienced an Entomologist as Mr. Westwood, to determine, in many cases, the species, or even the Orders to which they belonged.

A great many have, however, been identified, and, according to the list given by Mr. Brodie, in his "History of the Fossil Insects in the Secondary Rocks," and by Dr. Giebel, in his "Fauna der Vorwelt," the *Coleoptera*, *Orthoptera*, *Neuroptera*, *Hemiptera*, and *Diptera* are represented by some 65 species, distributed as follows, viz. :—

Coleoptera ...	...	18 species.	Hemiptera ...	...	14 species.
Orthoptera ...	...	10 „	Diptera ...	...	13 „
Neuroptera...	...	10 „			
					65

The *Coleoptera* appear to have been very well represented, and to have included *Buprestidæ*, *Carabidæ*, *Curculionidæ*, *Chrysomelidæ*, *Elateidæ*, *Cantharidæ*, *Tenebrionidæ*, &c. Mr. Westwood also detected amongst the insect remains from this formation, *Cercopidæ*, *Cimicidæ*, *Tipulidæ*, *Blattidæ*, *Aphidæ* and *Gryllidæ*.

On the subject of the remains from the Dorsetshire Purbecks, Professor Westwood observes, "With the exception of the Dragon flies, of which there are as many as 34 fragments of single wings

¹ See "Introductory Observations," by Professor Westwood, to Brodie's "History of the Fossil Insects in the Secondary Rocks of England.;" and the "Quart. Journ. Geol. Soc.," for 1854.

(from which, however, it is impossible to affirm either a moderate or tropical climate), and of a large ant (?) wing¹, it is worthy of remark that the whole of these remains, not fewer than 700 or 800, are those of minute insects, not more than a fourth or a third of an inch in length." Further on, in the same paper, he says, "If we take into consideration the small and even minute size of the great majority of the insects, and, indeed, of the whole of the *Coleoptera* which have been passed under review, the idea that we have before us the wreck of an Insect Fauna of a temperate region is at once raised; for, although it would be rash to assert that a mass of remains of the existing tropical insects might not be accumulated in which a large quantity of minute beetles and flies would not be present, yet I cannot conceive any process, either arising from currents of water or chemical dissolution of insect matter, which would carry off or destroy the many gigantic forms of insect life always occurring in the tropics. The fossils before us show abundant evidence of the presence of numbers of lignivorous species, such as the *Elateridæ* and *Buprestidæ*, but we nowhere find amongst them traces of the great *Lamellicorn* and *Longicorn* Beetles. Herbivorous insects also occur in considerable numbers, but we do not meet with the gigantic Grasshoppers and Locusts of tropical climates."

Entomologists² are aware that sudden inundations, or the rapid rising of rivers, are sure to bring with them vast quantities of insects which are carried away by currents in great numbers, and congregated together in masses.

It appears that, with a few exceptions, there is a very general conformity between the insects from the Dorsetshire Purbecks and those of Wilts and Bucks. There would, however, appear to have been a great difference in the manner of deposition of the strata of the two districts, as evidenced by the remarkable contrast presented by the state of preservation of the insects of the Wiltshire Purbecks,

¹ Prof. Rupert Jones, F.R.S., has informed me that the ant wing was not obtained from Purbeck strata. See his letter at p. 348, Vol. vii., of the "Geol. Mag.," July, 1870.

² In a letter dated the 20th July, 1878, Mr. Alfred Russell Wallace remarks that "the quantity of insects carried down and drowned during floods is enormous. About 30 years ago the late T. V. Wollaston gave an account in the 'Zoologist' of his entomologising in South Wales, among the *débris* left by a flood. The *débris* literally swarmed with insects, especially beetles, and he obtained an enormous haul, including many excessively rare species."

and that of those of the Dorset Purbecks. In the *former* numbers of specimens are in a fair state of preservation, while in the *latter*, the remains consist, almost always, of fragments of wings, elytra or bodies.

KIMMERIDGE CLAY.

Mr. P. B. Brodie¹ states that at Ringstead, in Dorsetshire, this Clay is traversed by a bed of sandy laminated stone, about two feet thick, and this is succeeded by dark-coloured shale and clay, containing large blocks of *Septaria*, in one of which he discovered a striated elytron of a small Beetle.

With this exception, I have been unable to find any record of the discovery of insect remains from this part of the Upper Oolite.

MIDDLE OOLITE.

OXFORD CLAY.

The only trace of an insect from this division of the Oolite was found by Mr. J. C. Pearce, near Christian Malford. Professor Westwood thought that this fossil might possibly be that of a larva of a *Libellula*.²

LOWER OOLITE.

FOREST MARBLE.

The only record of the discovery of fossil insects from this part of the Oolite is made by Mr. P. B. Brodie, who states that in some of the quarries in this series at Farleigh, near Bath, he found a few elytra of small Beetles.

GREAT OOLITE.

Elytra of *Coleoptera*³ are recorded from the Great Oolite in the eastern Moorlands of Yorkshire. The discovery of these remains is also alluded to by Dr. Mantell⁴ in the "Medals of Creation."

¹ See the "Quart. Journ. Geol. Soc." Vol. ix., p. 51. 1853, and a paper "On the Distribution and Correlation of Fossil Insects," by the Rev. P. B. Brodie, Warwick, 1874.

² Figured by Brodie in his "Fossil Insects," plate iv., fig. 13.

³ See Brodie's paper "On the Distribution and Correlation of Fossil Insects," *antea cit.*

⁴ See the "Medals of Creation," Vol. ii., p. 555. See also the "Bridgewater Treatise," Vol. ii., p. 78; also "London's Mag. of Nat. Hist.," Vol. iii., p. 361. In a note at page 379 of the "Quart. Journ. Geol. Soc." for 1854, reference is made by Professor Westwood to a fossil insect having been discovered by Professor Morris in the Great Oolite of Lincolnshire.

STONESFIELD SLATE.

The remains of insects in this formation appear to be almost confined to a few families of *Coleoptera*, and they are generally in a very fragmentary condition, and consequently most difficult to determine.

Dr. Buckland has described the wing of a large *Neuropterous*¹ insect from the Stonesfield Slate, which has been named *Hemerobioides giganteus*;² and in the list at the end of Mr. Brodie's paper "On the Distribution and Correlation of Fossil Insects" another specimen of a *Neuropterous* insect is enumerated (*Libellula Westwoodi*), besides two large wings, referred to the *Libellulidæ* which were found at Eyeford on the Cotswolds, by Mr. Brodie.

The remains of *Coleoptera* from this Slate have been referred by Brodie and Westwood to some seven families, including *Buprestidæ*, *Curculionidæ*, *Coccinellidæ*, *Prioniidæ*, &c.

By far the most interesting fossil insect from the Stonesfield Slate is the wing of a large species which Professor Westwood, Mr. Bates, and Mr. Butler believe to be *Lepidopterous*. In the³ "Proceedings of the Entomological Society of London" for 1872,⁴ we find the following notice of its exhibition at a meeting of that Society. "Mr Butler exhibited a remarkably perfect impression of the wing of a fossil butterfly, in the Stonesfield Slate. It appeared to be most nearly allied to the now existing South American genus, *Calligo*." Mr. Butler⁵ subsequently named this fossil *Palæontina Oolitica*, and described and figured it in his "*Lepidoptera Exotica*." He observes—"Though a British insect, this species belongs to a group so completely tropical, that I do not hesitate to describe and figure it in the present work; its nearest allies are the genera *Calligo*, *Dasyophthalma*, and *Brassolis*, all three essentially tropical American genera. *P. Oolitica* is especially interesting as being the oldest fossil butterfly yet discovered; the most ancient previously known to Science (*Neorinopsis sepulta*)

¹ See "Geol. Proc.," Vol. ii., p. 688, and Mantell's "Medals of Creation," Vol. ii., p. 552.

² Dr. Hagen states that this insect should be referred to *Apochrysa*

³ Page xxxvi., 1872.

⁴ See Sir Sidney Smith Saunders's observations on this fossil in his Anniversary Address to the Entomological Society (when President of that Society) in January, 1874.

⁵ See "*Lepidoptera Exotica*" pp. 126-8, by A. G. Butler. It was also described and figured in the "Geological Magazine," Vol. x.

having been found in the¹ Cretaceous series (white sandstone of Aix la Chapelle) whilst the bulk of the known species are from the Lower Miocene beds of Croatia; it is also interesting as belonging to the highest family of butterflies, and to a sub-family intermediate in character between two others, viz., the *Satyrinæ* and *Nymphalinæ*, whilst the more recently discovered fossils are referable, with one exception, to the two latter groups. The nervures appear to have been impregnated with iron, which will partly account for their well defined condition."

Mr. Scudder, who states that he carefully examined the original fossil, considers Mr. Butler to be in error in referring this wing to a *Lepidopterous* insect, and is of opinion that it should be considered *Homopterous*, and allied to *Cicada*.

Mr. Butler has himself directed my attention to the neuration of this wing, as figured, and also to that of some of the *Cicadæ* in the British Museum Collection, and from a comparison of figures of the wing with these insects I am inclined to agree with Mr. Butler, who in his view is supported by Professor Westwood and Mr. Bates. At the same time, as we have no evidence of the existence of true flowers at this period, there seems a certain amount of probability in favour of the correctness of Mr. Scudder's opinion as to the insect not being *Lepidopterous*.

Since the date of the discovery of *P. Oolitica*, another fragment of a supposed fossil butterfly has been found in the Stonesfield Slate, and is, or was until quite lately, in the possession of J. Parker, Esq., of Oxford. This fossil² has not yet, I believe, been figured or described.

LIAS AND RHÆTICS.

The Lias, including therein the Rhætic series, is in *this country*, the oldest formation of the Secondary Period in which fossil insects have been detected.

In some sections of this formation insect remains have been discovered in such abundance that the beds containing them have, as

¹ This is an error of Mr. Butler's: the insect was found at Aix, in Provence, in strata belonging to the Upper Eocene period.

² In January, 1878, I was informed by Prof. Westwood that this fossil was too fragmentary to admit of its being referred with certainty to the *Lepidoptera*, or any other order. Jan. '79.

in the "Purbecks," been called the "Insect Limestone." Fossil insects have been found, chiefly in the lower division of this formation, in Gloucestershire,¹ Worcestershire, Warwickshire, Somersetshire, Dorsetshire and on the borders of Monmouthshire; a few have also been found in Yorkshire.² They are generally in a much more fragmentary condition than those from the "Purbecks," and are less common than in the latter formation.

Mr. Brodie states that he first discovered these interesting fossils in the immediate neighbourhood of Gloucester, and³ he adds that some of the beds of limestone in the lowest division of the Lias, in the Vale of Gloucester, abound in insects, and that beautiful specimens, chiefly elytra and wings, have also been found in the Upper Lias at Dumbleton and Alderton.

At Dumbleton, which is N.E. of Cheltenham, Mr. Brodie obtained from the Upper Lias shales one nearly perfect *Neuropterous* insect, of which Professor Westwood⁴ says—"It possesses an arrangement of the wing veins differing from that of any English species, and also from any foreign species known to me, but it comes nearest to the small *Libellulæ* forming the genus *Diplax*."

In the Upper and Middle portions of the Lower Lias, which are extensively developed in the neighbourhood of Gloucester and Cheltenham, traces of insects are said to be exceedingly scarce, but at Wainlode Cliff, on the banks of the Severn, near Gloucester, the Insect Limestone has produced remains of several genera of *Coleoptera*. In the Insect Limestone, to the South West of Combe Hill, not far from the last mentioned locality, Mr. Brodie obtained a great number and variety of insect remains, consisting

¹ In a note at p. 378 of the "Quart. Journ. Geol. Soc.," Vol. x., 1854, Prof. Westwood states that "A rich collection of fossil insects, from the Lias of Gloucestershire, &c., has been made by W. R. Binfield, Esq., to whom also the Museum of the Geol. Soc. is indebted for a suite of insects from the Lias of Lyme Regis." I am not aware that these insects have ever been described.

² The Rev. J. F. Blake has described and figured two fragments of insects from the Yorkshire Lias. One specimen consists of an elytron of a beetle, named by Mr. Blake *Buprestites bractoides*, and the other specimen consists of two wings of a *Neuropterous* insect, apparently belonging to some species allied to *Chauliodes*, which Mr. Blake has named *Chaulioidites minor*. See "The Yorkshire Lias," by Ralph Tate, and J. F. Blake. London, 1876, p. 426, and plate xvi., figs. 5 and 6.

³ See Brodie's "Fossil Insects," p. 51-103, and the "Quart. Journ. Geol. Soc.," Vol. iv., 1846, p. 14-16.

⁴ See "Quarterly Journal of the Geological Society," Vol. v., 1849, p. 31-35.

chiefly of the elytra of *Coleoptera* and a few imperfect but large wings of *Libellulidæ*.

At Apperley, near Wainlode Cliff, remains of insects have been found in plenty, many small slabs, three or four inches square, exhibiting several elytra and wings, and a few small Beetles.

From the Insect Limestone, near the village of Hasfield, Gloucester, many elytra of *Coleoptera* have been obtained. The same formation, in the neighbourhood of Forthampton near Tewkesbury, has also furnished fossil insects, belonging to the same families as those found in the localities before mentioned.

At Strensham, about nine miles from Evesham, insects have been obtained from a bed of Insect Limestone at the bottom of a large quarry. Amongst them was found part of the abdomen of a gigantic species of *Libellula*, which Mr. Brodie named *Libellula Hopei*. In the neighbourhood of Evesham the Insect Limestone has produced numerous remains of insects, the wings and elytra of many of which are said to be beautifully preserved. In the Lower division of the Lias, in this neighbourhood, Mr. H. E. Strickland¹ discovered small elytra of *Coleoptera* and portions of the wings of *Libellulidæ*.

From one quarry near Bidford, Warwickshire, Mr. Brodie obtained a small species of the family *Gryllidæ*, which he named *Gryllus Bucklandi* in honour of Professor Buckland.

In some of the quarries in this neighbourhood (Bidford) the wings of *Libellulidæ* were obtained not uncommonly, particularly at a place called the "Nook," where a beautiful specimen was found, which has been described and figured by Mr. Strickland.²

Mr. E. T. Higgins obtained from the Lower Lias or the Rhætics, in the Southern parts of Gloucestershire and the adjoining County of Somersetshire, in the neighbourhood of Bristol, numerous remains of insects. From Aust, near Bristol, and from Sudbury, on the Monmouthshire side of the Severn, about three miles from Chepstow, the Insect Limestone and the "Landscape Stone" have afforded a quantity of remains. In some slabs the insects were found embedded together in masses. In one slab Mr. Higgins is stated to have detected as many as 30 small Beetles.

¹ "Quart. Journ. Geol. Soc.," 1846, Vol. iv., pp. 14-16.

² See "The Annals and Magazine of Natural History," Vol. iv., p. 301, (new series).

From the frequency of such delicate creatures as insects in the Landscape stone, and in another band of limestone only a few feet higher, some of which are said to be beautifully preserved, and could not have been long subject to the action of the waves, it is supposed by Mr. Brodie, that this part of the Lias may have been formed in an estuary, which received the waters of some neighbouring coasts, and which brought down the remains of insects and plants.

The *Coleoptera* appear to have been abundant in the Lias, for out of some 300 specimens, or parts of specimens of insects obtained from this formation, examined by Professor Westwood, more than one third were referred by him to this Order, and included representatives of the *Buprestidæ*, *Elateridæ*, *Curculionidæ*, *Chrysomelidæ*, *Carabidæ*, *Telephoridæ*, &c. Most of the species appear to have been very minute, "never equalling in size," observes Mr. Westwood, "those from the Stonesfield Slate." The other orders represented in this formation are the *Orthoptera*, the *Neuroptera*, the *Hemiptera*, and (possibly) the *Diptera*?

The remains of *Orthoptera* include *Gryllidæ* and *Blattidæ*; the *Hemiptera* include *Cicada* and *Cimex*, and the *Neuroptera*, *Libellula*, *Agrion*, *Orthophlebia*, *Hemerobius*, *Æschna*, *Chauliodes* and *Ephemera*. Among these various families and genera we have omnivorous, herbaceous, and predaceous species. Many of the families and genera found in the Lias are common both to it and the Purbecks.

Although, as a rule, the remains of insects from this formation are very imperfect and fragmentary, the detached wings of many *Neuropterous* insects are preserved in the greatest perfection, and have the nervures of the wings beautifully defined. The size of the insects, judging from the remains, appears to have been usually small and indicative of a temperate climate.

It may be observed that nearly all the fossil insects from this formation have, with the exception of a few specimens from the Upper division, been obtained from the *lowest*¹ division of the Lias, or from the Rhætic series, between the Lias and the Trias. Remains of insects from the Lias and Rhætics are very numerous, but the majority of them are in such a fragmentary condition that

¹ Since this paper was read in January, 1878, I have received from Charles Moore, Esq., F.G.S., of Bath, a large collection of fossil insects from the *Upper Lias* of Ilminster. This collection includes *Coleoptera*, *Neuroptera*, *Orthoptera*, &c., all of which I hope shortly to describe.

it has been impossible, even for those who have devoted special attention to the subject, to make out the species to which they belong. About 56 species, however, have been determined, which are distributed amongst five orders as follows, viz. :—

Coleoptera	... 29 species.		Hemiptera	... 6 species.
Neuroptera	... 12 „	(supposed)	Diptera?	... 2 „
Orthoptera	... 7 „			

No traces of *Lepidoptera* or *Hymenoptera* have been met with, and the remains which have been referred to the *Diptera* are extremely doubtful.

CONTINENT OF EUROPE.

CRETACEOUS.

As the Upper Cretaceous Rocks are, for the most part, of marine origin remains of insects are, of course, very rarely met with in them.

From certain beds of sand in the neighbourhood of Aix la Chapelle, which have been referred to the Upper Cretaceous Period, Dr. Debey¹ obtained about ten species of *Coleoptera*, chiefly *Curculionidæ* and *Carabidæ*.

Professor Pictet² states that M. Desmoulins found elytra of *Coleoptera* in the Chalk Marl of the Mountain of St. Catherine, near Rouen.

Dr. Geinitz has called attention to the remains of perforated wood in the Upper and Lower Greensands of Saxony, which he considers to be evidence of the existence of Longicorn Beetles at this period. He believes that the insects, which made these perforations, belonged to the *Cerambycidæ*.

M. Charles Brongniart³ in April, 1876, called the attention of the Entomological Society of France to a piece of fossil wood, obtained from the Gault of Lottinghem, Pas de Calais, containing numerous perforations. M. Brongniart believes these perforations to have been made by some species of beetle belonging to the genus *Hylesinus*, of the family *Scolytidæ* (Xylophaga.)

¹ Lyell's "Elements," 6th edit., page 331.

² "Traité élémentaire de Paléontologie," Vol. iv., pp. 95 and 102.

³ See "Les annales de la Société Entomologique de France," V^e serie., p. 217. 1876.

UPPER OOLITE.

SOLENHOFEN SLATE.

The most celebrated formation of this period on the Continent, from which fossil insects have been obtained in any number, is that of the well-known lithographic stone of Solenhofen,¹ in Bavaria.

The oldest account of fossil insects from this formation is found in Schröter's² "Real-und verbal Lexicon," published in 1779. In 1783 Esper³ referred to the discovery of a species of *Gryllus* in the Solenhofen Slate; and in 1826⁴ Van der Linden described a *Neuropterous* insect from Solenhofen, as *Æschna antiqua*.

Reference to fossil-insects from the Solenhofen slate is also made by Marcel de Serres,⁵ in 1829; and Brunn,⁶ in 1835, enumerated *Coleoptera*, *Neuroptera*, *Hymenoptera* and *Lepidoptera* (?) from the same formation.

In 1839⁷ Professor Germar⁸ published descriptions of 17 species from Solenhofen, including *Coleoptera*, *Orthoptera*, *Neuroptera*, *Hymenoptera*, *Hemiptera*, and *Diptera*. Several species from this locality were also described (in 1841) by Count Münster,⁹ including a *Lepidopterous* (?) insect,¹⁰ which he referred to the *Tineina*.

¹ Of this formation, Lyell observes — "Although the number of *Testacea* in this Slate is small, and the plants few, and those all marine, Count Münster had determined no less than 237 species of fossils, including 26 species of insects. These insects, among which is a *Libellula* or dragon-fly, must have been blown out to sea, probably from the same land to which the flying lizards and other contemporaneous reptiles resorted."

² "Real und verbal Lexicon," 1779, II., s. 93; III., s. 72; and in "Neue Literatur und Beiträge zur Kenntniss," Leipsic, 1784, I. c., 410.

³ "De animalibus oviparis," pp. 18-19, Erlangæ, 1783.

⁴ "Mem. Acad. Brux.," Vol. iv., p. 247, 1826.

⁵ "Géognosie des terrains Tertiaires," &c. Livre iv^{me}. Sec. iii., p. 244, 1829.

⁶ "Von Insekten einege Käfer (*Cerambyx*, *Hydrophylus*), *Neuropteren* (*Libellula*, *Æschna*, *Agrion*, *Myrmeleon*), *Hymenopteren* (*Sirex*, *Ichneumon*). Schmetterlinge (*Sphynx*)," &c. "Lethea Geognostica," Vol. i., p. 210. 1835-1837. (See also Quenstedt, "Handb. d. Petrefaktenk.")

⁷ "Nova Acta. Akad. Leopold. Carol.," 1839, xix., 2 s., 187-222, t. 21-23.

⁸ Dr. Hagen observes of these insects:—"The species described by Germar, in the 'Acta Acad. Leop.,' to which hitherto reference has always been made, are described from specimens, the outline of which has been artistically painted and completed. I have often examined the types carefully, and can certainly maintain that this account of them is correct." "Entomologists Annual," 1862, p. 1.

⁹ "Beiträge zur Geognosie und Petrefaktenkunde," Bayreuth, 1841.

¹⁰ Of this insect M. Pictet observes, "Le Comte de Münster a décrit, sous le nom de '*Tineites Lithophilus*' un insecte des Schistes Lithographiques de Bavière, qu'il considère comme appartenant à la famille de *Tineides*, mais que la vue de la figure me ferait plutôt considérer comme un *Termes*."—"Traité de Paléontologie," Vol. iv., p. 111.

Dr. Giebel, in his "Fauna der Vorwelt,"¹ (Insecten und Spinnen), published in 1856, enumerates 26 species from Solenhofen, including—

Coleoptera ...	...	2 species.	Hemiptera ...	...	4 species.
Orthoptera ...	...	4 „	Lepidoptera (?) ...	...	1 „
Neuroptera ...	...	12 „	Diptera ...	...	2 „
Hymenoptera ...	...	1 „			

Dr. Hagen,² who has paid especial attention to the Solenhofen *Neuroptera*, has described 33 species of that Order, and has also given a list of 36 species contained in the Royal Collection in the Academy of Munich.

Of the 36 species of *Neuroptera* in the Munich Collection, Dr. Hagen states that 27 are dragon flies, some of which belong to extinct genera, but others to such as now live in America and Australia; he also³ adds that many of the fossil insects from this formation, preserved in the Munich Collection, and in the Collection of Dr. Krantz, of Bonn, are in a splendid state of preservation. One-third of the entire collection is *Libellulidæ*, another third consists of *Orthoptera* and *Hemiptera* (especially gigantic species of *Belostoma*, *Pygolampus* and *Nepa*); and the remaining third consists of *Coleoptera*, *Hymenoptera* and *Diptera*. Out of 450 specimens of fossil insects in the Munich Collection 150 are *Neuroptera*, and out of these 136 belong to the *Odonata*.

The *Odonata*, according to Hagen, comprise the following, viz:—

Libellulina ...	...	4 species.	Calopterygina ...	...	11 species.
Æschnina ...	...	1 „	Agriionana ...	...	4 „
Gomphina ...	...	7 „			

The *Gomphidæ* are said to belong principally to species referable to genera similar to *Petalia*, *Phenes*, and *Petalura*, of which a few species occur at the present day in Chili and Australia. The fossil *Gomphina* of Solenhofen, are generally very large, and some are truly gigantic⁴—four inches in length, with an expanse of wings of $7\frac{1}{2}$ inches.

Of the *Calopterygina*, the group *Heterophlebia* contains some of

¹ "Fauna der Vorwelt," II. (Die Insecten und Spinnen der Vorwelt), s. 392 to 426. 1856.

² "Ueber die Neuropteren aus dem lithographischen Schiefer in Bayern," in "Palæontographica," Vol. 10, pp. 96-145. 1862. "Palæontographica," Vol. xv., 1865-1868, and the "Entomologists' Annual," for 1862.

³ See "Entomologists' Annual" for 1862.

⁴ See the plates accompanying Dr. Hagen's papers, in "Palæontographica," Vols x. and xv., ante cit.

the most gigantic *Neuroptera*—two of them belong to the largest known *Odonata*, having an expanse of wing of $7\frac{1}{2}$ -8 inches, and bodies $3\frac{1}{2}$ -4 inches in length.

From a study of the fossil insects from the Solenhofen Slate, and a comparison of them with those from the English formations of the same age, Dr. Hagen has drawn two conclusions, viz.:—(First.) That the two fauna are very closely allied, and that possibly some species occur in both formations. (Secondly.) That the fauna of the English and Bavarian strata are not only quite distinct from the existing fauna, but also from those of Aix; of the Rheinish peat deposit (Brown Coal of the Rhine); of Ceningen and Radoboj; and from that of the Amber; differing not only in species but in genera.

Another large collection of fossil insects from Solenhofen is contained in the Teyler Museum at Harlem. Upwards of 80 species in this collection have been described by Herr H. Weyenbergh¹ junr., in the "Archives du Musée Teyler," and are enumerated by Dr. Winkler,² in his 2nd Supplement to the "Catalogue Systématique de la Collection Paléontologique du Musée Teyler."

The species obtained from the Solenhofen Slate which have up to the present time been described by Prof. Germar,³ Count Münster,⁴ Herr Carl von Heyden,⁵ Dr. Giebel,⁶ Dr. Hagen,⁷ and Herr H. Weyenbergh,⁸ amount in number to 114⁹ and are distributed amongst the existing Orders as follows:—

Coleoptera	...	...	29 species.	Diptera	...	...	5 species.
Neuroptera	...	...	46 "	Hymenoptera	...	5	"
Orthoptera	...	...	11 "	Lepidoptera	...	2	"
Hemiptera	...	...	16 "				
							114

¹ "Sur les Insectes fossiles du calcaire lithographique de la Bavière qui se trouvent au Musée Teyler" Archives du Musée Teyler.—Vol. ii., pp. 247-294, 1869. Vol. iii., pp. 234-240, and "Period Zool. Arg." t. 1.

² "Catalogue Systématique de la Collection Paléontologique du Musée Teyler." Harlem 1876, (Deuxième Suppt.)

³ "Nova Acta. Acad. Nat. Cur." T. xix. 1839.

⁴ "Beiträge zu Geog. und Petref.," 1841.

⁵ "Palæontographica." Vol. i. pp. 99-101, 1851.

⁶ "Fauna der Vorwelt." Vol. ii., 1856. and "Zur fauna des Lithographischen Schiefers von Solenhofen." 1857.

⁷ "Enumeration des Odonates fossiles d'Europe" "Revue des Odonates" by E. de Selys-Longchamps, pp. 356-364, 1850; "Palæontographica," Vol. x., 1861. 1863; Vol. xv., 1865, 1868; and the "Entomologists' Annual." 1862.

⁸ "Archives du Musée Teyler," &c., antea cit.

⁹ For lists of species see post pages 148 & 149.

This list is especially important, as it includes two undoubted species of *Lepidoptera*.

LIAS.

From the lower marls of the Lias, at Schambelen in the Canton of Aargau, in Switzerland, about 2,000 specimens of fossil insects have been obtained. These specimens have been carefully studied by Professor Heer, who is of opinion that this locality is the only one on the Continent, in which so large a number of primæval insects have been preserved to our time.¹

The 2,000 specimens comprise 143 species, which are distributed as follows :—

Species.			Species.		
Coleoptera ...	...	116	Hemiptera ...	...	12
Orthoptera ...	...	7	Hymenoptera ? (very		
Neuroptera...	...	7	doubtful) ...	...	1
					<hr/> 143

No *Lepidoptera* or *Diptera* have as yet been discovered. One small wing is described as being that of a *Hymenopterous* insect, but as no remains of the *Hymenoptera* have been obtained elsewhere from strata of this period—even in those localities in which insect remains have been found in abundance—it is probable that this wing belonged to an insect of another Order.

The *Coleoptera*² are represented by some sixteen families, amongst which are *Carabidæ*, *Gyrinidæ*, *Cryptophagidæ*, *Nitidulidæ*, *Peltidæ*, *Cistelidæ*, *Rhyncophora*, *Chrysomelidæ*, *Byrrhidæ*, *Hydrophilidæ*, *Buprestidæ*, *Elateridæ*, *Telephoridæ*, &c.

The presence, in large numbers, of those beetles whose larvæ are wood feeders, and who in their perfect state are usually found on or under the bark of trees, is evidence of the existence of woods or forests during this period; and the presence of several genera of fungus beetles implies the existence of fungi. The *Buprestidæ* are represented by 33 species. Of the *Byrrhidæ* four species have been found in this formation; three of them—*Byrrhidium arcuatum*, *B. morio*, and *B. troglodytes*—are among the most abundant insects at Schambelen, and as they are all moss feeders, Professor

¹ "Urwelt der Schweiz," *antea cit.*

² For list of families, see post-page 149.

Heer supposes that the ground and the trees were more or less covered with mosses, although no remains of these plants have been preserved. The leaf-eating beetles are represented by, amongst other species, two of the family *Chrysomelidæ*. Of Carnivorous beetles 29 species have been found, and the Water-beetles are represented by some 20 species.

The *Orthoptera* comprise three species of *Blattidæ* (cockroaches), three grasshoppers, and one earwig; and the *Neuroptera* are represented by six species of *Termites* (or white ants) and one dragon fly—*Æschna Hageni*—which is perhaps larger than any living¹ species, except *Gynacantha plagiata*.

The *Hemiptera* include nine species, distributed amongst the *Cercopidæ*, *Lygæidæ*, and *Cicadidæ*.

Dr. Heer observes that it may be safely inferred from the richness of the insect fauna that the land was of considerable extent. Some of the insects are of large size, but the majority are small, some even smaller than the smallest of the allied species of the present day, as is also the case with the insects of the English Lias. Judging from the size of the Liassic insects, one would infer a temperate climate, but the numerical proportion existing between certain families tends to the conclusion that a warmer climate then prevailed.

So far as I am aware the only other locality on the Continent in which insect remains have been discovered in the Lias, is Bayreuth,² where Count Münster is said to have detected traces of wings of insects.³

TRIAS.

No traces of insects have as yet been found in the Triassic rocks of the United Kingdom, and only seven specimens have been recorded from Continental Europe. Of these seven specimens three have been referred to the *Coleoptera*, three to the *Neuroptera*, and one to the *Orthoptera*.

The three species of *Coleoptera* have been described by Dr.

¹ See plate iv. in pt. 1, "Trans. Ent. Soc., London," 1878.

² Bronn's "Lethæa Geognostica," Vol. i., p. 210.

³ Since this paper was read in January, 1878, seven species of *Coleoptera* have been described by Dr. Heer from the Rhætic formation of Schonen, in Sweden. (See "Åftryck ur Geol. Föreningens i Stockholm Föreläsning," 1878, No. 49, Bd. iv., No. 7).

Heer,¹ and respectively named *Glaphyroptera pterophylli*, *Curculionites prodromus*, and *Chrysomelites*² *Rothenbachi*; the two first-named were discovered in the Keuper of Vadutz, and the third specimen was obtained from the Keuper of Rothenbach.

The three specimens of *Neuroptera*³—*Chauliodites Picteti*, *C. Zinckeni*, and *C. Helveticus*—have also been described by Dr. Heer. The two first named specimens were obtained from the Bunter of Trebitz and Salzmunde, and the third specimen from the Keuper.

The only *Orthopterous* insect from the Trias was also obtained from the Bunter of Trebitz. It belongs to the family *Blattidæ* (cockroaches), and has been described⁴ by Dr. Heer, who placed it in a new genus—*Legnophora*—and named it *Girardi*, after Prof. Girard, of Halle, in whose collection it was discovered.

This specimen concludes the scanty list of fossil insects obtained from the Trias of Continental Europe.

AMERICA.

TRIAS.

In the "Geological Magazine" for May, 1868, Mr. Scudder records one species of *Coleoptera* from the Trias of North America, and he observes that "in the Triassic rocks of the Connecticut Valley some questionable tracks have been referred by Hitchcock to Insects⁵ and Myriopods."

I have lately been informed⁶ by Mr. Scudder that a vast quantity of insects from Secondary rocks have been recently discovered in America, and will be described by him in due course.

The following is, I believe, a complete list of all the fossil insects which have, up to the present time, been described from the Secondary formations of the United Kingdom and the Continents of Europe and America.

¹ See "Le Monde Primitif de la Suisse," p. 99; "Neuer Denkschriften der Schweiz Naturforsch. Gesellschaft." xiii, 1853 (figured in Taf. vii.).

² "Flora Foss. Helveticæ," p. 76, Taf. xvii., 1877.

³ "Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich," p. 279. 1864.

⁴ "Vierteljahrsschrift der Naturf. Gesellsch. in Zurich," 1864, *antea cit.*

⁵ See also Dana's "Manual of Geology," 1874, p. 411.

⁶ *In litt.*

A LIST OF INSECT REMAINS DISCOVERED IN THE
FORMATIONS OF THE SECONDARY OR
MESOZOIC PERIOD.

EUROPE.

GREAT BRITAIN.

LOWER CRETACEOUS OR NEOCOMIAN

From Ironstone¹ and Shales at the "Govers," near St. Leonards-on-Sea :—

Elytra of Coleoptera and wings or parts of wings of Coleoptera,
Neuroptera and Diptera.

From the Wealden Marlstone between Tonbridge and Maidstone :—

Elytra of Coleoptera.

From the Wealden of the Isle of Wight :—

Elytra of Coleoptera.

From the Wealden of Punfield Bay, Swanage, Dorsetshire :—

Elytra and wings of insects.

UPPER OOLITE.

MIDDLE AND LOWER PURBECKS.

From Durl'stone Bay, Swanage, Dorset :—

COLEOPTERA.²

Hydrophilus Brauni.	Cymindis Beyrichi.
Hydroporus Neptuni.	„ antiqua.
Carabus Westwoodi.	Buprestium gorgus.
Carabidium Dejeanum.	„ stygnus.
Harpalus Knorri.	„ Woodlei.
„ Ewaldi.	„ dardanus.
„ anactus.	„ bolbus.
„ Burmeisteri.	Ancylochira teleas.
Harpalidium nothrus.	Agrilus strombus.

¹ See a paper "On the occurrence of Fossil Insects in the Wealden Strata of the Sussex Coast" "Quart. Journ. Geol. Soc.," Vol. x., p. 171, 1854.

² This list is compiled from Prof. Westwood's paper in the "Quart. Journ. Geol. Soc.," Vol. x., Nov., 1854; and from Dr. Giebel's "Fauna der Vorwelt" (Insekten und Spinnen), pp. 187, 393-426.

<i>Agrilus stomphaz.</i>	<i>Chrysomela Dunkeri.</i>
„ <i>cyllarus.</i>	„ <i>dubia.</i>
„ <i>cyllabacus.</i>	„ <i>ignota.</i>
<i>Elaterium pronæus.</i>	„ <i>tertiaria.</i>
„ <i>triopas.</i>	<i>Coccinella Neptuni.</i>
„ <i>barypus.</i>	„ <i>Perses.</i>
„ <i>Oweni.</i>	<i>Prionus antiquus.</i>
„ <i>Morrisi.</i>	<i>Lamia Schroeteri.</i>
<i>Tentyridium peleus.</i>	<i>Curculionites Syrichthys.</i>
<i>Crypticus Unger.</i>	„ <i>Westwoodi.</i>
<i>Helopium agabus.</i>	„ <i>tuberculatus.</i>
<i>Diaperidium mithrax.</i>	„ <i>marginatus.</i>

ORTHOPTERA.

<i>Gryllidium Oweni.</i>	<i>Rithma Murchisoni.</i>
<i>Mantis ? (undetermined).</i>	„ <i>Morrisi.</i>
<i>Blattina anceps.</i>	„ <i>antiqua.</i>
„ <i>recta.</i>	„ <i>ramificata.</i>
<i>Rithma Westwoodi.</i>	<i>Nethania Molossus.</i>
„ <i>Purbeccensis.</i>	<i>Blatta elongata.</i>

NEUROPTERA.

<i>Ela brephos.</i>	<i>Chimarra Pytho.</i>
<i>Elcana tessellata.</i>	<i>Libellula agrias.</i>
„ <i>Beyrichi.</i>	<i>Libellulium Kaupi.</i>
<i>Abia Sipylus.</i>	<i>Estemoa Bubas.</i>
„ <i>duplicata.</i>	<i>Phryganidæ.</i>
<i>Hagla ignota.</i>	

HEMIPTERA.

<i>Neurocoris ?</i>	<i>Cercopis Telesporus.</i>
<i>Lygæites Dallasi.</i>	„ <i>Schæfferi.</i>
„ <i>furcatus.</i>	„ <i>Signoreti.</i>
„ <i>priscus.</i>	<i>Cercopidium Hahni.</i>
<i>Cicada psocus.</i>	„ <i>trigonale.</i>
<i>Cercopis Mimas.</i>	

DIPTERA.

<i>Simulidium priscum.</i>	<i>Corethrium pertinax.</i>
<i>Thiras Westwoodi.</i>	<i>Campylomyza grandæva.</i>

HYMENOPTERA.

<i>Ponera Brodieri.</i>	<i>Myrmica Heeri.</i>
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LEPIDOPTERA ?

<i>Cyllonium Boisduvalianum.</i>	<i>Cyllonium Hewitsonianum.</i>
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Professor Westwood¹ has specifically named and also figured the

¹ See "Quart. Journ. Geol. Soc.," 1854, Vol. x., pp. 393-397.

following species from the Middle and Lower Purbecks of Dorset :—

<i>Elaterium pronæus</i> .	<i>Agrilium stygnus</i> .
<i>Helopium agabus</i> .	„ <i>stomphax</i> .
<i>Curculium Syrichthus</i> .	„ <i>cyllarus</i> .
<i>Formicium Brodiei</i> .	„ <i>cyllabacus</i> .
<i>Buprestium Woodlei</i> .	<i>Ctenicerium blissus</i> .
„ <i>teleas</i> .	„ <i>hylastes</i> .
<i>Blapsium Egertoni</i> .	<i>Harpalidium nothrus</i> .
<i>Harpalidium anactus</i> .	<i>Telephorium abgarus</i> .
<i>Tentyridium peleus</i> .	<i>Buprestium bolbus</i> .
<i>Corethrium pertinax</i> .	<i>Panorpidium tessellatum</i> .
<i>Cercopidium minus</i> .	<i>Cimicidium Dallasi</i> .
„ <i>telesphorus</i> .	<i>Raphidium brephos</i> .
<i>Libellulum agrias</i> .	<i>Cyllonium Boisduvalianum</i> .
<i>Eschnidium bubas</i> .	„ <i>Hewitsonianum</i> .
<i>Cicadellium dipsas</i> .	<i>Gryllidium Oweni</i> .
„ <i>psocus</i> .	<i>Libellulum Kaupii</i> .
<i>Buprestium gorgus</i> .	<i>Carabidium dejeanum</i> .
<i>Diaperidium mithrax</i> .	<i>Cercopidium Hahnii</i> .
<i>Simulidium priscum</i> .	„ <i>Schæfferi</i> .
<i>Termitidium ignotum</i> .	„ <i>Signoreti</i> .
<i>Panorpidium tessellatum</i> .	<i>Nepidium Stolones</i> .
<i>Cecidomium grandævum</i> .	<i>Myrmicium Heeri</i> .
<i>Blattidium molossus</i> .	<i>Blattidium nogaus</i> .
<i>Elaterium triopas</i> .	„ <i>achelous</i> .
„ <i>barypus</i> .	„ <i>symyrus</i> .
<i>Buprestium stygnus</i> .	<i>Phryganeidium Pytho</i> .
„ <i>vulgus</i> .	<i>Agronidium Ætna</i> .
„ <i>dardanus</i> .	

List of insect remains, chiefly from the Lower Purbecks of Wilts and Bucks, extracted from Brodie's "Fossil Insects," and his paper on "The Distribution and Correlation of Fossil Insects":—

(1.) COLEOPTERA.

<i>Carabidæ</i> .	<i>Harpalidæ</i> .
<i>Staphylinidæ</i> .	<i>Colymbetes</i> .
<i>Cerylon</i> .	<i>Elateridæ</i> .
<i>Helophorus</i> .	<i>Curculionidæ</i> .
<i>Cyphon</i> .	<i>Limnius</i> .
<i>Rhynchophora</i> .	<i>Cantharidæ</i> .
<i>Buprestidæ</i> .	<i>Hydrophilidæ</i> .
<i>Tenebrionidæ</i> .	<i>Helophoridæ</i> .

(2.) ORTHOPTERA.

<i>Acheta</i> .	<i>Blatta</i> .
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(3.) NEUROPTERA.

Leptoceridæ.	Æschna.
Phryganeidæ.	Lindeniæ.
Termes.	Libellula.
Corydalidæ.	

(4.) HEMIPTERA.

Kleidocerys.	Cercopis.
Cixius ?	Cicada.
Ricania.	Delphax.
Asiraca.	Velia.
Aphis.	Hydrometra.
Cimicidæ.	Molobius.

(5.) DIPTERA.

Simulium.	Chironomi.
Platyura.	Culex.
Tanypus.	Chironomus.
Empidæ.	Rhyphus.
Sciophila.	Macropeza.
Macrocera.	Tipulidæ.

From the Lower Purbecks of the Vale of Wardour, in Wiltshire:—

COLEOPTERA. ¹

Elmis Brodiei.	Philonthus Kneri.
Helophorus antiquus.	Prognatha crassa.
„ Brodiei.	Elatér Purbeccensis.
Hydrobius Purbeccensis.	„ Werneri.
Hydrophilus Westwoodi.	Cyphon vetustus.
„ Brodiei.	Meloe Hoernesii.
Carabus elongatus.	Tenebrio rugoso-striatus.
Camptodontus Angliæ.	Cerylon striatum.
Cymindis antiqua.	Hypera antiqua.

ORTHOPTERA.

Gryllus Sedgwicki.	Elisama minor.
Blattina Stricklandi.	Blatta pinna.
„ similis.	„ Kollari.
„ recta.	„ Ungeri.
Elisama Kneri.	„ pluma.

NEUROPTERA.

Bittacus dubius.	Æschna perampla.
Panorpa gracilis.	Libellula petrificatus.
Orthophlebia bifurcata.	„ jurassica.
„ minuta.	„ antiqua.
Zalmona Brodiei.	Termes grandævus.

¹ This list is compiled from Brodie's "Fossil Insects," his paper on the "Correlation of Fossil Insects," and Dr. Giebel's "Fauna der Vorwelt."

HEMIPTERA.

Hydrometra ?	Asiraca Kengotti.
Cicada punctata.	Delphax pulcher.
Flata Haidingeri.	Cercopis lanceolata.
Ricania fulgens.	Aphis valdensis.
Cixia maculata.	„ plana.
Asiraca Egertoni.	„ dubia.

DIPTERA.

Remalia sphinx.	Adonia Fittoni.
Hasmona leo.	Chironomus extinctus.
Bria prisca.	„ arrogans.
Simulidium humidum.	Macropeza prisca.
Thimna defossa.	Asuba Brodiei.
Sama rustica.	Dara fossilis.

From Lower Purbecks (Ridgway Quarries, near Dorchester):—

Numerous elytra of Coleoptera
And a fragment of the wing of a Neuropterous insect.

From Purbeck (?) strata in the neighbourhood of Swindon,
Wilts :—

Elytra of Coleoptera.

KIMMERIDGE CLAY.

From a block of Septaria in the Kimmeridge Clay, near
Ringstead, Dorsetshire :—

Fragment of an elytron of a small beetle. ¹

MIDDLE OOLITE.

OXFORD CLAY.

From the Oxford Clay near Christian Malford :—

Supposed larva of an insect, possibly a *Libellula*.

LOWER OOLITE.

FOREST MARBLE.

From quarries at Farleigh, near Bath :—

Elytra of Coleoptera and small wings. ²

GREAT OOLITE.

From the Eastern Moorlands of Yorkshire :—

Elytra of Coleoptera.

¹ "Quart. Journ. Geol. Soc.," 1853.

² Brodie's "Fossil Insects," p. 37.

STONESFIELD SLATE.

From the Stonesfield Slate, Stonesfield, Oxfordshire, and Sevenhampton and Eyeford, Gloucestershire:—

COLEOPTERA.¹

Blapsidium Egertoni.	Blapsidæ? (Elytra f.)
Buprestidæ.	Prionus ooliticus (Brod.)
Curculionidæ.	Pimeliidæ?
Melolonthidium,	Chrysomelidæ?
Prionideum.	Coccinella? Wittsii.

NEUROPTERA.

Hemerobioides giganteus.	Libellulæ? (two wings of.)
Libellula Westwoodi.	

LEPIDOPTERA. ?

Palæontina oolitica. ²	And wing of Lepidopterous ? insect unnamed. ³
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LIAS.

List of Insects from the English Lias, extracted from the Rev. P. B. Brodie's⁴ paper on "The Distribution and Correlation of Fossil Insects:—"

<i>Insects.</i>	<i>Locality.</i>	<i>Geological Horizon.</i>
Libellula.	Dumbleton.	Upper Lias.
„ (Heteroplebia)		„
„ Brodiei.	„	„
Æschna.	„	„
Agrion.	„	„
Orthoptera.	„	„
Blattidæ.	„	„
Beetles of several } genera. ⁵	ditto.	Upper Lias.
	and Alderton.	
Body of gigantic Libellula.	Strensham.	
Libellula.	Strensham.	Lower Lias.
Orthoplebia, {	Wainlode, Forthampton, Bidford, Brown's } wood, Strensham, Cracombe, and } Somersetshire.	ditto.

¹ This list is compiled from Brodie's "Fossil Insects," and his paper on the "Correlation of Fossil Insects."

² P. oolitica (Butler), Stonesfield Slate. "Geol. Mag.," Oct., 1874. Plate xix., figs. 4 and 5.

³ Wing of supposed Lepidopterous insect, from Stonesfield Slate, Oxford, in the collection of J. Parker, Esq., of Oxford.

⁴ "Proceedings of the Warwickshire Naturalists' and Archæologists' Field Club," 1874.

⁵ This list is simply *extracted* from Mr. Brodie's before-mentioned paper. No attempt has been made to amend the arrangement, or to correct any but clerical errors.

<i>Insects.</i>	<i>Locality.</i>	<i>Geological Horizon.</i>
Æschna.	Bidford.	Lower Lias.
Chauliodes.	{ Brown's wood, Hasfield, Strensham, Bin- ton, Copt Heath, Knowle. }	ditto.
Ephemera.	{ Strensham, Brown's wood, Binton, West- bury. }	ditto.
Myrmeleon ?	Binton.	ditto.
Trichopterous.	Grafton.	ditto.
Libellulideous	{ Strensham, Brockeridge, Binton, Wilmcote, } wings, chiefly, { Grafton, Brown's wood, Barrow on Soar. }	ditto.
Hemerobius (wing of), most nearly allied to the recent		
Polystæchetes. (Scudder).		ditto.
COLEOPTERA.		
Carabidæ.	Apperley, Brockeridge.	ditto.
Harpalideous Carabidæ.	Binton, Wilmcote.	ditto.
Buprestidæ or } Elateridæ. }	Vale of Gloster near } Churchdown. }	Lima beds.
Elytra of two or three } other genera. }	The Leigh.	Lima shales.
Buprestidæ or } Elateridæ. }	Wainlode, Apperley, } Brockeridge. }	Lower Lias.
Elateridæ.	Wainlode, Apperley, Westbury.	ditto.
Buprestidæ.	Strensham.	ditto.
Gyrinus.	Forthampton.	ditto.
Ditto, like a foreign } species. }	Norton.	ditto.
Pentatomidæ (body of).		
Telephoridæ.	Forthampton, Wainlode, } Brown's wood. }	ditto.
Curculionidæ or } Chrysomelidæ. }	Apperley, Hasfield.	ditto.
Chrysomelidæ.	Forthampton.	ditto.
Aquatic Beetle.	Wainlode.	ditto.
Laccophilus (Dyticidæ).	Hasfield.	ditto.
Melolontha.	Cracombe.	ditto.
Trogulus.	Strensham.	ditto.
Tettigonia (Pupa of).	Wainlode.	ditto.
Elater or Buprestis. } (large entire beetle.) }	Strensham.	ditto.
Elytra of several } species. }	Westbury	ditto.
Elytra of two species } of Coleoptera. }	Hotham, Yorkshire.	ditto.
Under wings of Beetles.		ditto.
Upper surface of } anal segment of }	Hotham.	ditto.
a Beetle.		

ORTHOPTERA.		
<i>Insecta.</i>	<i>Locality.</i>	<i>Geological Horizon.</i>
Species of (Orthoptera).	Grafton.	Lower Lias.
Gryllidæ.	Wilmcote, Binton, Apperley, } Grafton, Forthampton. }	ditto.
Blattidæ.	Wainode, Strensham.	ditto.
Locusta ? (under wing.)	Strensham.	ditto.
HEMIPTERA		
Cicada.	Hasfield.	ditto.
Belostoma.	Wainode.	ditto.
Hemelytra of a } Cicada like Meloe. }	Forthampton, Apperley, Wainode.	ditto.
Cimex.	Strensham.	ditto.
Gigantic Homoptera.	Binton,	ditto.
Homopterous larva.	Strensham.	ditto.
DIPTERA.		
Asilus.	Forthampton.	ditto.
Tipula (entire insect head, antennæ and wings.)	} Strensham.	ditto.
Diptera (entire), undeter- mined.	} Wainode, Apperley.	ditto.

List of insect remains from the English¹ Lias and Rhætics compiled from Dr. Giebel's "Fauna der Vorwelt," &c. :—

COLEOPTERA.

Melolontha greithana.	Elatér vetustus.
Berosus liasinus.	„ socius.
Buprestites bractoides.	„ Neptuni.
Gyrinus natans.	„ Redtenbacheri.
„ dubius.	„ angulatus.
Laccophilus aquaticus.	„ varius.
Harpalus Heeri.	Telephorus Haueri.
„ liasinus.	Chrysomela Andraei.
„ Schlotheimi.	„ liasina.
Ancylochira liasina.	

NEUROPTERA.

Elcana Beyrichi.	Orthoplebia furcata.
Orthoplebia longissima.	„ liasina.
„ communis.	Hemerobius Higgsi.
„ parallela.	Hagla gracilis.
„ similis.	„ similis.
„ intermedia.	„ deleta.
„ lata.	„ ignota.

¹ Wainode Cliff, Apperley, Hasfield, Tewksbury, Forthampton, and other parts of Gloucestershire, Worcestershire, Warwickshire, Somersetshire, Monmouthshire, and Yorkshire.

Diastatomma liasina.	Heterophlebia Buckmanni.
Libellula Brodiei.	„ Westwoodi.
„ Hopei.	Rapha liasina.
Heterophlebia dislocata.	Chauliodites minor.
ORTHOPTERA.	
Akicera Heeri.	Blattina liassina.
„ Frauenfeldi.	„ incompleta.
HEMIPTERA.	
Pachymerus Zucholdi.	Cicada Murchisoni.
Belostomum liasinum.	
DIPTERA ?	
Asilus ignotus ?	

CONTINENT OF EUROPE.

CRETACEOUS.

From beds of sand in the neighbourhood of Aix la Chapelle:—
Several species of Coleoptera, chiefly Curculionidæ, and Carabidæ. ¹

From the Chalk Marl of the Mountain of St. Catherine, near
Rouen :—

Elytra of Coleoptera. ²

From the Gault³ of Lottinghem, Pas-de-Calais :—

Traces of Coleoptera, supposed to belong to the genus *Hylesinus* of the
Scolytidæ.

From the Upper and Lower Greensands of Saxony:—

Traces of Longicorn Beetles, supposed to be *Cerambycidæ*.

UPPER OOLITE.

SOLENHOFEN SLATE.

List of genera of insects from Solenhofen and Pappenheim,
compiled from Brönn's "Lethæa Geognostica," Vol. i, p. 210
(1835-1837).

COLEOPTERA.	
Cerambyx	Hydrophilus.
NEUROPTERA.	
Libellula.	Æschna.
Agrion.	Myrmeleon.
HYMENOPTERA.	
Sirex.	Ichneumon.
LEPIDOPTERA.	
Sphinx ?	

List of the fossil insects from Solenhofen, described by Prof.

¹ "Lyell's Elements," 6th edit, p. 331.

² "Traité élémentaire de Paléontologie," Vol. iv, pp. 95 and 102.

³ "Ann. Soc. Ent. de France." 1876, p. 217.

Germar, in the "Nova Acta" of the Academy of Leopold Charles of Austria, 1839, xix, 2 s, 189-222.

<i>Locusta speciosa.</i>	<i>Sciara prisca.</i>
„ <i>priscus.</i>	<i>Æschina Munsteri.</i>
<i>Chresmoda obscura.</i>	„ <i>gigantea.</i>
<i>Ditoptera dubia.</i>	<i>Libellula longialata.</i>
<i>Belostomum elongatum.</i>	<i>Agrion Latreillei.</i>
<i>Nepa primordialis.</i>	<i>Scarabæides deperditus.</i>
<i>Pygolampis gigantea.</i>	<i>Ricania hospes.</i>
<i>Cerambycinus dubius.</i>	<i>Musca lithophila.</i>
<i>Apiaria antiqua.</i>	

Fossil insects from Solenhofen, enumerated by Dr. Giebel, in his "Fauna der Vorwelt" (Insecten und Spinnen):—

COLEOPTERA.

<i>Scarabæides deperditus.</i>	<i>Mesosa Germari.</i>
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ORTHOPTERA.

<i>Phaneroptera Germari.</i>	<i>Chresmoda obscura.</i>
<i>Locusta prisca.</i>	<i>Decticus speciosus.</i>

NEUROPTERA.

<i>Agrion vetustum.</i>	<i>Æschna longialata.</i>
<i>Diastatomma Münsteri.</i>	„ <i>gigantea.</i>
<i>Æschna Charpentieri.</i>	„ <i>intermedia.</i>
„ <i>Schmideli.</i>	„ <i>Buchi.</i>
„ <i>antiqua.</i>	„ <i>bavarica.</i>
„ <i>Parkinsoni.</i>	<i>Libellula Koehleri.</i>

HYMENOPTERA.

Apiaria antiqua.

HEMIPTERA.

<i>Pygolampis gigantea.</i>	<i>Belostomum elongatum.</i>
<i>Nepa primordialis.</i>	<i>Ricania hospes.</i>

DIPTERA.

<i>Musca lithophila.</i>	<i>Sciara prisca.</i>
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The following list of fossil insects from Solenhofen includes (to the best of my knowledge) every species which has, up to the present date, been described by Professor Germar,¹ Count Münster,² Herr Carl von Heyden,³ Dr. Giebel,⁴ Dr. Hagen,⁵ and Herr Weyenbergh, jun.⁶

¹ "Nova Acta." Acad. Nat. Cur. T. xix., 189-222. 1839.

² "Beiträge," T. v. 1841.

³ "Palæontographica," Vol. i., pp. 99-101. 1851.

⁴ "Fauna der Vorwelt," Vol. ii. 1856. "Zur Fauna des Lithographischen Schiefers von Solenhofen." 1857.

⁵ "Enumeration des Odonates Fossiles d'Europe." "Revue des Odonates," by E. de Selys-Longchamps, pp. 356-364. 1850. "Palæontographica," Vol. x., pp. 96-145. 1861-1863, and Vol. xv., pp. 59-96, 1865-1868.

⁶ "Archives du Musée Teyler," Vol. ii., pp. 247-294. 1869. Vol. iii., pp. 234-240, and "Period. Zool. Arg." t. i. (See also "Catalogue systematique de la Collection Paléontologique du Musée Teyler," 1876, by Dr. Winkler.

COLEOPTERA.

Mesosa Germari.	Lacon petrosus.
Chrysobothrys veterana.	Elater Teyleri.
Ditomoptera dubia.	„ Costeri.
Carabicina decipiens.	„ grossus.
Scarabæides deperditus.	Tenebrio innominatus.
Carabus Winkleri.	Anisorhynchus (?) lapideus.
Hydroporus petrefractus.	Saperdides cristallus.
Gyrinus (?) Jurassicus.	Leptura primigenia.
Silpha tennilythris.	Cryptocephalus antiquus.
Scaphidium Hageni.	„ mesozoicus.
Hister relictus.	Chrysomela lithographica.
Meloe Bavaricus.	„ rara.
Oryctes Pluto.	Cassida æquivoca.
Cetonia (?) defossa.	Coccinella Heydeni.
Buprestis lapidelythris.	

NEUROPTERA.

Isophlebia Aspasia.	Petalura varia.
„ Helle.	„ differenz.
Stenophebia æqualis.	Libellula (?) densa.
Heterophlebia dislocata.	„ abscissa.
„ Amphitrite.	„ nævia.
„ Phryne.	„ valga.
„ eximia.	Termes heros.
„ casta.	„ lithophilus.
Euphœa multinervis.	„ fossilis.
„ filosa.	Ephemera cellulosa.
„ areolata.	„ procera.
„ longiventris.	„ mortua.
Agrion hecticum.	„ prisca.
„ exhaustum.	„ Meyeri.
„ Eichstättense.	„ deposita.
„ vetustum.	Hemerobius prisca.
Anax Charpentieri.	„ fossilis.
Petalia longialata.	Chrysopa protogaea.
Petalura gigantea.	„ Solenhofensis.
„ latialata.	Apochrysa excelsa.
„ eximia.	Nymphes fossilis.
„ intermedia.	Myrmeleon extinctus.
„ Münsteri.	Corydalis vetusta.

ORTHOPTERA.

Forficularia problematica.	Locusta prisca.
Gryllites dubius.	„ speciosa.
Phaneroptera Germari.	„ amanda.
„ striata.	Blabera invita.
Chresmoda obscura.	Achita quærula.
Blattaria Dunckeri.	

HEMIPTERA.

<i>Velia cornuta.</i>	<i>Nepa primordialis.</i>
<i>Naucoris lapidarius.</i>	<i>Propygodlampis Bronni.</i>
<i>Corixa mortua.</i>	<i>Pygodlampis gigantea.</i>
<i>Belostomum Hartingi.</i>	<i>Actea sphinx.</i>
„ <i>elongatum.</i>	(<i>Hagenia</i> ?) <i>Schroeteri.</i>
<i>Ricania gigas.</i>	<i>Cicada Proserpina.</i>
„ <i>hospes.</i>	„ <i>prisca.</i>
<i>Lystra Vollenhoveni.</i>	„ <i>gigantea.</i>

DIPTERA.

<i>Asilicus lithophilus.</i>	<i>Empidia Wulpi.</i>
<i>Musca lithophila.</i>	<i>Cheilosia dubia.</i>
<i>Tipularia Teyleri.</i>	

HYMENOPTERA.

<i>Apiaria antiqua.</i>	<i>Anomalon palæon.</i>
„ <i>lapidea.</i>	<i>Bombus?</i> <i>conservatus.</i>
„ <i>veterana.</i>	

LEPIDOPTERA.

<i>Sphinx Snelleni.</i> ¹	<i>Pseudosirex Darwini.</i> ²
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LIAS.

List of fossil insects from the Lower Marls of the Lias at Schambelen, in the Canton of Aargau, in Switzerland, compiled from Dr. Heer's "Urwelt der Schweiz" :—

COLEOPTERA.

	Species.		Species
Carabidæ	... 11	Buprestidæ	... 33
Gyrinidæ	... 6	Elateridæ	... 10
Nitidulidæ	... 7	Telephoridæ	... 3
Peltidæ	... 4	Cistelidæ	... 1
Cryptophagidæ	... 2	Rhynchophora	... 7
Lathridiadæ	... 1	Chrysomelinæ	... 3
Mycetophagidæ	... 1	Doubtful forms	... 6
Byrrhidæ	... 5	Total number of species	—
Hydrophilidæ	... 15	of Coleoptera	116
Aphodiidæ	... 1		—

ORTHOPTERA.

<i>Blattina formosa.</i>	<i>Acridiites deperditus.</i>
„ <i>angustata.</i>	„ <i>liasinus.</i>
„ <i>media.</i>	<i>Baseopsis forficulina.</i>
<i>Gomphocerites Bucklandi.</i>	

¹ From the figure of this insect, in Herr Weyenbergh's paper, it undoubtedly belongs to the Sphingidæ.

² "Arch. Teyl." t. iii., p. 279, and "Period. Zoo. Arg." t. i., pl. 3.

NEUROPTERA.

Clathrotermes signatus.	Calotermes troglodytes.
Calotermes maculatus.	„ obtectus.
„ plagiatus.	Æschna Hageni.

HEMIPTERA.

Protocoris insignis.	Cicadellinæ (3 species.)
„ ovalis.	Cercopidium morio.
Cyclocoris pinguis, and other species of Coreodea.	„ minutum.

HYMENOPTERA ? ¹

Palæomyrmex prodromus.

RHÆTICS.

List of fossil insects from Schonen, Sweden ² :—

COLEOPTERA.

Hydrophilites Nathorsti.	Elytridium lævigatum.
Buprestites rugulosus.	Carabites deplanatus, and frag- ments of the abdomen of a beetle.
Curculionites parvulus.	
„ Carlsoni.	
Elytridium angelini.	

TRIAS.

From Trebitz, Salzmünde, and Vadutz, Switzerland:—

COLEOPTERA.

Glaphyroptera pterophylli.	Chrysomelites Rothenbachi.
Curculionites prodromus.	

NEUROPTERA.

Chauliodites Picteti.	Chauliodites Helveticus.
„ Zinckeni.	

ORTHOPTERA.

Legnophora Girardi.

AMERICA. ³

TRIAS.

From the Triassic Rocks of the Connecticut Valley :—

Coleoptera, one specimen unnamed, and traces of various *Insecta* and *Myriopoda*.

¹ No traces of insects of this Order have been elsewhere recorded from rocks of this age, even in those localities in which insect remains have been found in abundance, and it is highly improbable that the Order had appeared at so early a period.

² See "Ueber einige Insektenreste aus der rætischen Formation Schonen," Aftryck ur Geol. Föreningens i Stockholm Förhandl., 1878, No. 49 (Bd. iv, No 7), and see *ante*, p. 136.

³ See *ante*, p. 137.