

to Ettingshausen, in the Cretaceous epoch, progressed continually throughout the Tertiaries, during which period was prepared the way for later and still greater divisions. With the dawn of the post-Tertiary, this differentiation was for the most part accomplished, and in Europe the tropical and Australian forms had been gradually pushed out by those of our temperate zone. So says Ettingshausen. We cannot do better than conclude this notice by translating almost verbatim the inferences which he draws at the conclusion of his paper from the facts we have been considering. They are as follows:

1. All the present natural Floras of the earth are connected together through the elements of the Tertiary Flora.

2. The character of a natural Flora is determined by the more pronounced development of some of the Flora-elements (the chief-elements).

3. In the construction of the recent Floras the collateral-elements have shared, as far as climatal conditions permitted. A mixture of plants has resulted, possessing characters foreign to the general Flora, sometimes present only in subordinate numbers, but sometimes in such rich masses that they appear distinctly characteristic.

4. The representative species in the present phyto-regions are members, mutually corresponding one with another, of the same or similar Flora-elements.

NOTICES OF MEMOIRS.

I.—THE INSECT-FAUNA OF THE TERTIARY PERIOD.

At a meeting of the Brighton and Sussex Natural History Society, held on March 8th, at the Brighton Free Library and Museum, Mr. H. Goss, F.L.S., F.Z.S., etc., communicated a paper on "The Insect Fauna of the Tertiary Period, and the British and Foreign formations in which Insect-remains have been detected." Mr. Goss remarked on the neglect of Fossil Entomology in this country, and called attention to the importance of an acquaintance with fossil insects, and the valuable conclusions which might be arrived at from their study, bearing upon the geological conditions of the earth during the respective periods of its existence. He also observed that the researches of Professor Heer had taught us that the study of insect-remains, and a comparison of the numerical proportion existing between the *Carnivorous* and *Herbivorous* species of any period with that existing at the present day, would afford a valuable clue to the state of the vegetation and climate prevailing in former periods.

After quoting Sir Charles Lyell as to the importance of an acquaintance with fossil insects, Mr. Goss reviewed the bibliography of the subject, beginning with Scheuchzer's "*Herbarium diluvianum*" (published in 1700). He called special attention to the importance of Professor Heer's great work "*Die Insekten Fauna der Tertiärgelände von Eningen und von Radoboj in Croatien*;" and to the

very valuable memoirs recently published by M. Oustalet, Mr. S. H. Scudder, and others. He also drew attention to the fact that the Rev. P. B. Brodie had published a book¹ on this subject so long back as 1845.

Mr. Goss then made some observations as to the nature of the strata in which insect-remains were most commonly detected, and offered some explanation of the reasons why fossil insects were frequently met with in marine formations. He then reviewed in descending order the principal deposits of the Tertiary period in which insect-remains had been detected in Great Britain, on the Continent, and in America.

After alluding to the remains of a few insects from Post-Tertiary strata, including *Coleoptera* from the Post-Glacial Drift near Colchester, and the Forest bed and lacustrine deposits in the cliffs along the Norfolk coast, and from the lignites of Uznach in Switzerland, he proceeded to enumerate the orders of insects, and the numbers of each, detected in British and Foreign Tertiary strata. With the exception of a few *Coleoptera* from the Lower Miocene of Antrim, Ireland, and from the Middle and Lower Eocene of the Isle of Wight, no well-authenticated remains appeared to have been found in English strata of this period. On the Continent they appeared to have been found in more or less abundance at Eningen in Switzerland, Radoboj in Croatia, Coirent and Menat in Auvergne, Siebengeberge on the Rhine, Aix in Provence, and Monte Bolca in Upper Italy.

The author quoted Sir C. Lyell's description of the Eningen strata belonging to the Upper Miocene period. From these strata Prof. Heer obtained 5081 specimens, comprising 844 species, viz:—*Coleoptera*, 518 species; *Neuroptera*, 27; *Hymenoptera*, 80; *Diptera*, 63; *Hemiptera*, 133; *Orthoptera*, 20; *Lepidoptera*, 3.

Mr. Goss alluded to the large proportion of Herbivorous *Coleoptera* amongst the Eningen fossils, and remarked that as they were always more abundant as the Equator was approached, it might be inferred that the climate of Eningen was at the period somewhat more tropical than at the present day, and this was, he said, the opinion of Dr. Heer and M. Oustalet. Allusion was then made to the present geographical distribution of the Eningen species.

From the Middle Miocene formation of Radoboj about 312 species had been detected. In these strata the *Hymenoptera* were the best represented. The Butterflies were represented by three species, one of which belongs to an extinct genus.

According to the researches of Bronn, Germar, Giebel, Dr. Heer, Dr. Hagen, and Herren C. von Heyden and L. von Heyden, the lignites of Rott in Siebengeberge near Bonn, belonging to the Lower Miocene, have produced about 90 species. From other deposits of Brown Coal about 125 species had been described by Dr. Hagen, C. von Heyden and others.

Mr. Goss drew attention to the remarkable formation known as

¹ "On the Fossil Insects of the Secondary Rocks," containing many interesting determinations of fossil insect-remains, by the Rev. P. B. Brodie, and Prof. J. O. Westwood, of Oxford.

“Indusial Limestone” and to other strata of the Auvergne, Central France. From these strata M. Oustalet had described some 49 species, 30 of which were referable to the order *Diptera*.

Reference was then made to the formations of Aix, in Provence, belonging to the Upper Eocene period, from which more fossil insects had been obtained than from any other deposits except Eningen.

One noticeable fact about these strata was that out of the nine Butterflies detected in the European Tertiaries, 5 of them had been found here.

The marls and limestones of Monte Bolca belonging to the Middle Eocene period were next referred to; seven species of insects have been described from them by Signor Massalongo.

The American strata of the Tertiary period in which fossil insects had been discovered were then noticed. It appeared from a paper of Mr. Scudder's that Mr. Richardson had discovered about 40 species of insects in these strata; besides these, about 31 species of *Coleoptera* have been described by Mr. S. H. Scudder of Boston, U.S.A.

In conclusion, fossil resin, or amber, from the Baltic, was described, and a list of the genera of the various orders of insects discovered therein was given, and allusion was made to the various writers who had treated of amber and its organic remains.

II.—ON SOME FUSULINA LIMESTONES. By DR. G. STACHE.

Imper. Geol. Institut. Vienna, Meeting December 19, 1876.

[Communicated by Count MARSCHALL, F.C.G.S., etc.]

A. From Upper Carniola.

NEW localities of *Fusulina*-rock in this district are—1. The Leptlin ravine, near Fauerburg; in the Carboniferous area of black and grey limestones and calcareous breccias. 2. Assling; white dolomitic limestones. 3. Neumarkt; dark-red calcareous breccias. 4. The Gerauth Valley, near Neumarkt; black limestones. 5. The same locality; white and light-grey limestones. 6. Brown sandy marls.

The black limestones of the first of these localities are particularly rich in large spherical forms, some of them agreeing with *Fusulina princeps*, Ehrenberg, sp. Other deposits contain a series of forms approaching externally the type of *F. cylindrica* or of *F. ventricosa*.

The facts at present known concerning the *Fusulina*-beds in the Southern Alps¹ lead to the following conclusions:—

1. The West to East extension of these beds in the Southern Alps is probably very considerable.

2. These strata differ much in petrographical type; they represent, however, a definite *facies* among the Carboniferous group, in some way analogous to that of the *Alveolina*-beds of the Istriodalmatic Lower Miocenes.

3. These *Fusulina*-rocks appear at various horizons both above and below the Upper Carboniferous series. They constitute, how-

¹ See also notes by Prof. E. Suess, *Proceed. Imp. Geol. Inst. Vienna*, Jan. 4, 1870.

ever, a coherent group of beds, mainly belonging to the upper subdivision of the Carboniferous group, thus representing a sea-coast *facies*, nearly equivalent to the dry land *facies* of the Upper Carboniferous sub-division abounding in vegetable remains.

B. *From Borneo.*

The *Fusulina*-limestones of this island are represented by two varieties (probably from different horizons), differing both lithologically and palæontologically.

1. The prevalent variety is a somewhat siliceous limestone, unequally speckled with light-yellowish and reddish-grey colours, intersected by white and reddish veins and fissures, and abounding in large spherical *Fusulinae*. These occur nearly complete, and somewhat silicified; or appear in various sections on the surfaces altered by decomposition. The prevalent form, with numerous whorls of the spiral, is essentially different from the form figured by Mr. Brady¹ as *Fusulina princeps*, Ehrenb. sp., showing (like the large spherical forms from Carinthia and Carniola) only six whorls. The new species, externally similar to the four-whorled Carinthian *F. Hoeferi*, St., is *F. Verbeeki*, Geinitz, characterized by the presence of from ten to twelve whorls.

Some sections are referable to *Alveolina*, or to a genus nearly allied; being types of a new species, *Alveolina* (?) *atavina*.

2. The second variety of *Fusulina*-rock is a variegated and generally fine-grained breccia, including some spherical forms, and very many sections of more abundant, smaller, cylindrical, thick-fusiform or oblong-oval individuals, varying in dimensions. According to the position of analogous calcareous breccias in the Southern Alps, these Bornean breccias may belong to an horizon immediately above that of the first variety.

C. *From the Isle of Chios.*

According to Mr. Teller, the *Fusulina*-limestones here appear so widely spread in the form of blocks and smaller fragments, that they may be supposed to be a rather important constituent in the geological structure of this island. These limestones are grey, and include an abundance of broken stems of Crinoids, together with rather frequent, large, and elongated *Fusulinae*, standing next to the Carinthian *F. Suessi*, St., and to the American *F. elongata*, Shum. Certain reddish and yellow portions of the limestone, rather sandy and argillaceous, exhibit on their decomposed surfaces several smaller forms of Foraminifera.

III.—ON THE JURASSIC FORMATIONS OF RUSSIA. By DR. NEUMAYR.

From the Reports Imperial Geological Institute Vienna, October, 1876.

[Communicated by Count MARSCHALL, F.C.G.S.]

A SEAM of earthy brownish coal, with coniferous wood, resting on limestone, considered to be Devonian, is worked at Tehoukovo, south of Moscow. The coal-seam is overlain by a bed of clay with pyritized Cephalopods characteristic of the lowermost Jurassics.

¹ GEOL. MAG. New Series, Vol. II. p. 537, Pl. XIII. Fig. 6.

The Upper Jurassic division is represented by light-coloured glauconitic limestones, containing Cephalopods, Gasteropods, and Brachiopods. Dr. Neumayr found the following fossils in the clay:—*Harpoceras Brightii*, Pratt; *H. lumula*, Ziet.; *Perisphinctes scopinensis*, sp. nov.; *P. Mosquensis*, Fischer (a characteristic Russian form); *Stephanoceras coronatum*, Brug.; *Cosmoceras Jason*, Ziet.; and *C. Pollux*, Rein.; all in a state of preservation closely resembling that of the fossils in the Ornatus-clays of Swabia. Of the above-named seven forms, five are commonly met with in the Middle and Upper Callovian of W. Europe, the zones of *Simoceras anceps*, and of *Perisphinctes athleta*; they must be considered as *Immigrants*; and even the two others may be modified descendants (?) of *Perisphinctes curvicosta*, a form widely spread over Central Europe.

The Fauna of Tchoulkowo is exceptional among the Jurassic Faunæ of Russia, both by its antiquity and by its striking analogy to those of Western Europe. The Fauna from the red and yellow Sandstones of Jelatma on the Oka is next related to it.

The Russian Jurassic formations, in descending order, are:—

- a. Inoceramus-bed of Simbirsk.
- b. Olive-green glauconitic sandstones, with *Amaltheus catenulatus*, Fisch., and *Perisphinctes fulgens*, Trauts.
- c. Aucella-bed, with *Amaltheus catenulatus*, Fisch., and *Aucella Mosquensis*. (Upper Moscow bed.)
- d. Beds with *Perisphinctes virgatus*, von Buch. (Mid. Moscow beds.)
- e. Beds with *Amaltheus alternans*, von Buch. (Lower Moscow beds.)
- f. Strata of Tchoulkowo and Jelatma, with *Cosmoceras Jason*, Ziet., and *Stephanoceras coronatum*, Brug.
- g. *Belemnite*-shales of Jelatma; besides several merely local deposits.

According to Dr. Trautschold, the division *e* answers to the deposits between the lowest "Bathonian" and the uppermost "Oxfordian;" division *d* being the "Kimmeridgian;" and division *e* the "Portlandian."

Dr. Neumayr is of opinion that only ten species of West-European Cephalopods, all characteristic of the Middle and Upper "Callovian" and of the Upper and Middle "Oxfordian," are met with in the Russian Jurassics, among which only the deposits of Tchoulkowo and Galiowa can be paralleled with those of Western Europe. The Fauna of the clays of Tchoulkowo and the equivalent deposits of Jelatma answer exactly to that of the Upper and Middle "Callovian," including a number of forms identical with those of Western Europe. The horizon of Galiowa (division *c*) yields forms referable to the zones of *Aspidoceras perarmatum* and *Peltoceras transversarium*, together with some specially Russian species. Some forms of division *d* may be considered to be representative types of Western forms, such as *Perisphinctes virgatus*, *P. polyplocus*, *P. Pallasianus*, d'Orb., and *P. Witteanus*, Oppel.

The divisions *a*, *b*, and *c* may be considered as equivalent to the Uppermost Jurassics; possibly division *a* may be even ranked among the Cretaceous series. The concordance with West-Euro-

pean forms, so conspicuous in the lower horizons, gradually diminishes upwards. The "autochthonic" forms of the Moscow Jurassic fauna, that is, those originated within the Centro-Russian Basin by transformation (?) of immigrated Western-European forms, are associated with the transformed (?) offspring of Indian immigrants (as some *Perisphinctes*, standing next to *P. frequens*, Oppel, a Tibetan form); and, in division *c*, with those from a third (northern) origin, such as *Amaltheus catenulatus*.

From all these facts, Dr. Neumayr endeavours to trace five distinct phases in the formation of the Russian Jurassics:—

1. Crimeo-Caucasian phase. Previously to the deposit of the "Kelloway" beds the Russian Basin is invaded by the sea, and Belemnitic shales, analogous to those of the Crimea and the Caucasus, are deposited.

2. Free communication with the Centro-European sea existing during the "Middle Callovian" Period, immigration and exclusive prevalence of a Fauna of unmixed Centro-European type obtain.

3. Continued immigration of Western forms; and immigration of others from the newly opened Indian Sea, in the beginning of the "Oxfordian" Period; with transformation (?) of the immigrants into autochthonic forms.

4. Connexion with the Western Sea closed; development of a special Russian Fauna in the *Perisphinctes virgatus* beds; Centro-European forms only represented by analogous species.

5. Great Northern transgression, coeval with the deposition of the *Aucella* beds; communication with the Northern Sea (probably already existing) notably enlarged; immigration of *Aucella*, *Amaltheus catenulatus*, and other extraneous types.

Dr. Neumayr described two new species: *Perisphinctes scopinensis* from the Ornatus-clays, and *Waldheimia Trautscholdi* from the glauconitic limestones of Tchoukowo.

IV.—REMAINS OF MAN AND PLEISTOCENE ANIMALS IN THE LOESS OF THE DANUBE. (From the Vienna Imperial Acad. Sciences, Meeting February 1, 1877.)

THE Danube, during the Diluvial (Pleistocene) Period, covered all the northern portion of the Vienna Basin; and left, on its retreat to its present channel, a thick deposit of laminated loam (Loess), overlying the Tertiaries. Near Zeiselberg, at the mouth of the Kamp Valley, Count Wurmbbrand discovered in 1876, beneath unmoved layers of Loess, a rich deposit of bones, and under that a blackish stratum abounding with fragments of charcoal and with flints bearing traces of human workmanship. Other deposits also with bones and worked flints exist in the neighbourhood. The bones in the Loess here are those of Diluvial (Pleistocene) animals, namely, Mammoth, Rhinoceros, Reindeer, Horse, Ox, Wolf, and Bear. The local conditions contradict the supposition that these remains were carried to their present position from a distance by currents of water or other agency. The excavations are still going on, partly at the expense of the Vienna Academy. COUNT M.

V.—FOSSILS FROM THE COAL-MEASURES OF BOHEMIA. By D. STUR and A. FRITSCH. Imp. Geol. Inst. Vienna, Meeting Dec. 5, 1876.

[Communicated by COUNT MARSHALL, F.C.G.S.]

1. Three species of fossil Plants were lately found for the first time between the first and second Coal-seams of the Kladno-Schlan Basin, namely, *Sphenopteris irregularis*, St. (together with *Asterocarpus Wolfsi*, Stur, in the same state of preservation as in the roof of the upper Coal-bed of Radnitz); *Alethopteris Serlii*, Brongn. (only the apex of a frond); and *Pecopteris elegans*, Germ. (a large fragment of a frond, agreeing in minute details with a specimen from Wettin in Saxony).

2. Animal-remains have only been met with in one subdivision (Radnitz Beds) of the Centro-Bohemian Carboniferous Formation. They all belong to essentially Terrestrial Animals—*Crustaceans*, *Arachnids*, and *Insects*; and are distributed thus:—

In the roof of the upper Radnitz Coal: *Lepidoderma Imhofi*, Reuss; *Xyloryctes planus* (borings).

In the upper Radnitz Coal-seam: *Gampsonyx*, sp. (in laminated coal).

In the roof of the lower Radnitz Coal: *Palaraenea borassifoliae*, Fr.; *Cyclophthalmus senior* (*Microlabis Sterubergi*), Corda; *Xyloryctes septarius* (borings).

In the floor of the Radnitz Beds: *Gampsonychus parallelus*, Fr.; *Acridites priscus*, André.

Excellent specimens of all these forms are preserved in the newly established Geological Museum of Prague.

VI.—THE DISTRIBUTION OF THE CEPHALOPODA IN THE UPPER CHALK OF NORTH GERMANY. [VERBREITUNG DER CEPHALOPODEN IN DER OBEREN KREIDE NORD-DEUTSCHLANDS, VON CLEMENS SCHLÜTER.] (Zeitschrift der Deutschen geologischen Gesellschaft, Band xxviii. heft 3.)

THIS Memoir by Herr Clemens Schlüter constitutes a kind of supplement to his work “Cephalopoden der oberen deutschen Kreide.”

The Upper Cretaceous beds of North Germany are subdivided into the following zones in ascending order, viz. :—

Zone of <i>Pecten asper</i> . „ <i>Amm. varians</i> . „ <i>Amm. Rhothomagensis</i> . „ <i>Actinocamax plenus</i> . „ <i>Inoceramus labiatus</i> . „ <i>Inoceramus Brongniarti</i> . „ <i>Heteroceras Reussianum</i> .	Zone of <i>Inoceramus Cuvieri</i> . „ <i>Amm. Margæ</i> . „ <i>Scaphites binodosus</i> . „ <i>Becksia Soekelandi</i> . „ <i>Amm. Cæsfeldiensis</i> . „ <i>Heteroceras polyplacum</i> .
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A brief sketch of the geographical extent, and equivalents in France or England when such exist, together with a list of the Cephalopoda obtained, is given under each of these headings; whilst appended will be found a table showing the respective vertical ranges of the 155 species of Cephalopods in the Chalk of North Germany; or, rather, their respective positions in the vertical series: for the most prominent fact revealed in this table is the limitation of these several species to the different horizons, only a few being common to two or sometimes three consecutive zones. B.B.W.