EXPLANATION OF PLATES XX. XXI.

PLATE XX.

- Fig. 1. Cone of *Pinites macrocephalus*, with the apophyses of some scales restored. Slightly reduced. From Mr. Dowker's collection.
 2. Diagram of transverse section of ditto from the Bowerbank specimen.
 3. Base of a cone of *P. ovatus*.
 4. Transverse section of ditto.
 5. Cone of *P. Susseziensis*.
 6. Transverse section of ditto.

PLATE XXI.

- Fig. 1. Part of an unopened cone of *Pinites Dunkeri*.
 2. Part of an opened cone of ditto.
 3. Cone of *P. Mantellii*.
 4. Cone of *P. patens*.
 5. Longitudinal section of *P. macrocephalus*, from Robert Brown's collection.
 6. Restored scale of ditto.
 7. Scale of *P. Susseziensis*.
 8. Longitudinal section of *Pinus Pinaster*.
 9. Scale of *Zamia Yatesii* seen from above.
 10. Ditto seen from the side.
 11. Cone of *Siquoiites Woodwardii*.
 12. Restored cone of ditto.
 13. Ovules of ditto, with the leaves broken off. Twice the natural size.
 14. A single ovule magnified.
 15 and 16. The two kinds of foliage.

III.—THE PRE-HISTORIC SETTLEMENTS OF THE REINDEER AGE IN SOUTHERN GERMANY.

[BEING THE SUBSTANCE OF THREE REPORTS ON THIS SUBJECT IN THE "STAATS ANZEIGER FÜR WÜRTTEMBERG," September and October, 1866. By Dr. OSCAR FRAAS, of Stuttgart.]

Translated by JOHN EDWARD LEE, F.S.A., F.G.S.

TWO years ago the French savans, Messrs. Lartet and Christy, laid before the Academy of Paris an account of their discoveries in the Dordogne, which proved the existence in that district of very ancient settlements of wild races of men, who kept herds of reindeer. Since then, up to the present time, no further proofs have come to light, either in France or Germany, of the extraordinary fact that this animal—the existence of which is now limited within the 70th degree of north latitude—ever lived so far south as our own districts. The account we have now to give will probably therefore be read with great interest.

At the head of the brook Schussen, which runs into the lake of Constance, was formerly a pond forming the springhead: the level of this pond was, at that time, 8ft. 8in. above that of the small neighbouring lake called the Feder See. But when the marshes of Steinhäusen were drained some years ago, and ditches were cut for this purpose, the water from the spring began to take a different course, and instead of flowing as formerly into the Rhine, now began to run in another direction into the Danube. Mr. Kaes, the proprietor of mills in Schussenried, therefore determined to deepen the spring-head and the water-course of the Schussen brook, and

this has been done to such an extent that the spring-head, which before (as mentioned above) was 8 feet above the Feder See, now is 13 feet below it, and the supply of water—now far greater than before—is made available first for the mills of Mr. Kaes, and afterwards for the royal foundry of Schussenried. While these works were going on, a great number of stags' horns and bones were found, and excited the curiosity of the resident naturalists: the matter was then taken up jointly by the Royal Cabinet of Natural History, and that of Antiquities, and very singular facts were brought to light during the excavation. Gigantic horns of the reindeer, from four to five feet long, and smaller ones, down to those of quite young fawns, lay there in the mud by hundreds: they were mixed with bones of the extremities, the skull, and the vertebræ of the same animal. The whole of these bones had been cracked and broken evidently to get out the marrow; so as to recall the accounts given us by travellers of the Ostiaks and Koriaks, who esteem the warm brain and marrow of recently-killed animals as very great delicacies. A large proportion of the horns have been formed in a very simple and inartificial manner into clubs or hammers, awls (some of which have projecting ears), or into agricultural tools, and other implements of incipient industry.

Here, then, we have the fact of the existence on this spot of one of the earliest known settlements of the human race. Let us glance for a moment at the changes which have taken place in this locality. But a short time since there was here the pleasant little tarn, the spring-head of the brook Schussen—700 years ago the Premonstratensian Monks built their monastery—1000 years still earlier a Roman road, with all its traffic, is said to have passed this way; but long before all these periods there existed here a settlement where human beings carried on all the avocations of life. Judging from the remains of their feasts, which appear to have been thrown into the clear little pond, these early settlers had abundance of animal food. Besides the remains of deer, there were found the broken skulls and bones of oxen, bears, and wolves; bones of birds and fish were also met with. Even the flesh of the northern glutton (*Gulo borealis*) was not despised, as is proved by a broken skull and some well-preserved teeth. Great hopes had been entertained of finding the skulls and bones of this primæval race of men, so that they might be examined by the critical eyes of the 19th century. These hopes, however, have not been gratified; but many particulars respecting the settlers may be gathered from the specimens found in the pond of Schussenried. The flint implements and the tools of reindeer horn are the evidence of great labour and perseverance; the abundance and variety of animal remains indicate their joyous feasts, and they also tell us what was their favourite food; while their ornaments and paints give us some faint notion of the manners of these settlers beyond the mere supply of the necessities of life.

After these general remarks, we will give a few detailed particulars as to the excavation and its results.

The "relic bed" (as it is now called), or the bed in which lie the

products of human industry, is from 15 to 19 feet below the surface, and about 12 square rods of it were laid open and carefully examined—no trace of metal was found, nor the mark of anything at all approaching that of a metal tool. Stone appears to have been almost the sole material amongst the settlers for obtaining the necessities of life. For this purpose, these early races naturally chose the hardest kinds, such as jasper and flint, which, having a conchoidal fracture, could more easily be made into what was wanted. Long narrow strips were then hammered off, some of them three inches in length, in some cases very sharp on one side, and in others, on both; sometimes very flat, like broad flakes, which apparently were set and wedged in wood, and sometimes very slight, and with fine points. Of all these varieties of flint flakes, from the size of a lancet, to that of a lance-head, about 600 specimens were found at Schussenried; most of them were lying together in one spot, probably indicating the place where the ancient tool-maker carried on his work, and struck off a number of flakes, out of which he chose the most convenient for use. Besides these, the flint-cores were scattered around from which these flakes had been struck. It is remarkable that amongst these flints, some are decidedly of foreign origin, only a part appear to have come from the neighbouring mountains; the majority were derived from the flint beds of the chalk hills either of Switzerland or France. Together with the flints there were found hundreds of common stones from the gravel of Upper Swabia, evidently brought together intentionally for some special object; some of them had been worked in a very rough manner. The large quantity of split skulls and bones show clearly that they had been broken by these stones for the sake of the marrow and brains; and probably the larger stones, neatly rounded off, which were found here and there, served for anvils or blocks. Occasionally, paints were met with, made of oxide of iron, ground down very finely, and probably kneaded with fat into small grains. The colour varies from a brick red to red brown, and is so effective, that both hands and face can be coloured a deep red with a little bit the size of a pin's head. It cannot be imagined that this red paste can have been scattered by accident amongst the stone implements and remains of bones; or that it has arisen from them by some chemical combination. Any unprejudiced person would consider it as a product of human art, probably similar to the paint so lavishly used by savage nations when preparing either for the war or the dance.

These mineral products, however, are of less interest than the remains of animals, which have evidently been used for food. The most important of all these is the reindeer (in German, *Renthier* not *Rennthier*, but with the first syllable *Ren* or *Rein*, so called by the northern nations, on account of its cleanliness, "*Reinlichkeit*"). This animal was evidently of the greatest importance to the pre-historic Swabians, on account of its flesh and marrow, and probably, also its milk was used; horns and portions of horns, parts of the skull, jaw-bones, vertebræ, ribs, and bones of the extremities lie mixed together; the only bones found united were some tarsal bones, and a few dorsal

and lumbar vertebræ, but with these exceptions, they were all lying together in a confused heap, like those in the refuse hole of a butcher's shop. Every bone which had contained marrow was broken in pieces, and not a single skull was found perfect—the vertebræ also had been partially split open, that everything eatable might be taken out. There were no traces of any cutting instruments on any of the bones; they had evidently been broken by blunt tools; in fact, by the stones above-mentioned. The horns of the adult reindeer, male and female, measure more than four feet; the right and left branches differ from each other, for the right branch bears a broad shovel-shaped plate, which may almost be said to shade the whole face. The branches are very much curved inwards, and a great number of projecting offshoots are placed on the shovel-shaped portion at the end. These horns lie by hundreds together, so that the greatest care was required, in excavating, not to injure them, but not a single perfect specimen was found; in every case either the offshoots were broken off, so as to leave the main branch isolated, or the branches were sawn in pieces lengthwise, apparently with the view of these pieces being turned or rather scraped into long round awls or daggers. The fact that of these implements only broken or waste specimens have been found, confirmed the view that the Schussen pond was merely a kind of refuse-pit, into which everything was thrown which had become useless. We can only mention two of these implements which were found perfect, and these probably were thrown away by chance; one of them is a pin or piercer about five inches long, with a round ear or handle, and as thick as the finger at the base; the other is a double pointed side-shoot of the horn, with one larger and one smaller round hole at the base. Another main branch has been worked into the form of a sabre with a solid hilt, just fitting the usual human hand. Besides the things cut out of horn, there were also pieces of broken wooden pins, thin and neatly scraped round like the wooden pins for making nets. The remains of reindeer very much exceed in number those of other animals, being nearly 98 per cent. of the whole; but still the other rarer relics are no less interesting as they help to complete the fauna of that age. The horse is the only one of our domestic animals which was found, and probably the remains were only from two or three individuals. In one case the skull is still nearly perfect, and it belonged to a species with a large head; while certain bones of the extremities indicate a strong, bony, and powerful animal. The brain cavity had been opened, the vertebræ had been split, and the bones containing marrow had been broken in pieces, so that there can be no doubt of horse flesh having been one of the table delicacies of the ancient Swabians.

It is also perfectly natural that the bear was used for food; the front portion of an under-jaw and some broken bones of this animal have been met with. As far as we can judge from these few remains (which afford, in fact, but slight means of comparison), this bear seems to have had but little resemblance to the brown bear (*Ursus arctos*), and agrees no better with the cave bear (*Ursus Spelæus*). The size of the teeth, and the presence of two premolars, and the

form of the first lower molar would rather indicate the *Ursus priscus* (Goldfuss), which some time since was found fossil in the Bavarian caves. But besides the bear and the horse, genuine carnivora were used for food; for the remains of the wolf, the fox, and the *Gulo*, or glutton, are found together in the same excavation. Of the wolf there is a broken under-jaw; of the fox there are not only several under-jaws, but several pieces of the skull and bones—these remains, however, do not belong to the fox of the present day, for the teeth of the Schussenried fox are smaller and thinner; the projections of the molar teeth are more pointed; the form of the skull is blunter, and a comparison of it with that of the recent fox leads to the conclusion that we have before us the remains of an Arctic or blue fox (the *Canis lagopus*), so notorious amongst travellers in the polar regions for its consummate audacity and thievish propensities. In hunting these animals nothing more is wanted than a cudgel in one hand and a piece of flesh in the other; or, according to Brehm, they are dug out of their holes in the snow by the Samojedes with a spade made of reindeer's horn. Besides the remains of the Arctic fox, there were found those of two individuals of the Glutton or *Gulo* (in German, Fälfress, or more commonly Vielfress; but in Swedish Felsenbewohner). This carnivorous animal of the far north, which is as much feared as the bear or the wolf, lies more especially in wait for the reindeer, on the backs of which it springs from the boughs of trees. The flesh of this animal also was eaten, as is proved by the bones of the skull having been opened. With the exception of the foot of an unknown small variety of ox, no further remains of mammalia were met with, and more particularly no trace of the game or domestic animals of the present day—no trace of the common cow, the sheep, the goat, the pig, or of the stag, the roe or the hare; nay, what is still more remarkable, no remains of the dog. Had these animals been living at that time in our districts we should most certainly have met with their remains in the Schussenried refuse. On the other hand, there are remains of birds and fishes which the ancient Swabians must have known how to secure by the bow and arrow and the fish-hook. Thus we have a very distinctive head and bones of the wild swan, which now breeds in the north; also many remains of a Penelope or tufted Pochard duck, somewhat larger than our present *Fuligula cristata*. Several bones of the extremities of the heron, a foot long, as well as other bones belonging to smaller birds, are now waiting careful examination. Some of the vertebræ of fish have belonged to a large pike.

Such are the main features of the late discoveries; they require only two remarks. First—That the facts now stated indicate the existence of an ancient intelligent race of men, quite unacquainted with the use of metals, and, like primæval man, having only stones to make use of in their struggle for existence; and secondly, that the discovery at Schussenried indicates a totally different climate, such as now begins at 70 degrees of north latitude in the arctic lands lying between the forest region and the frozen sea, which are free from snow only a few months in the year.

It is hardly necessary to say, that the age of these primæval men, and of the above mentioned climate, stretches far beyond that of the lake dwellings. In none of these lake settlements have any remains been found of arctic wild and apparently domesticated animals, as at Schussenried. Even in the oldest lake dwellings the animals which are companions of men, do not differ in species from those of the present day. No one, however, can believe that the Schussenspring was merely an isolated station of these primæval-men. Flint knives are found in various places scattered over our country, just as in the district of the Dordogne, and seem to have escaped the inquisitive eyes of our archæologists who have hitherto considered Roman roads and Celtic tumuli the earliest remains of our country. These implements of flint occur very commonly around the Schussenspring, and may be collected in considerable quantities when the ground is newly turned up, and this to such an extent as to be well known to the manufacturers of instruments for tobacco smokers.

There can be no doubt that numerous other places in Upper Swabia, besides Schussenried might serve to illustrate the grade of civilization of our ancestors. But the same cause which has preserved these relics—viz., the water, which protected them from the atmosphere renders the investigation of them in general very difficult. For how seldom is a trench nineteen feet deep excavated under the bed of a pond, and this in soft mud, as at Schussenried? and even when such works are undertaken, it is very rarely the case that a keen observer of nature is at hand like Mr. Valet, of Schussenried, who by utilizing the discoveries of chance has rendered incalculable service to science.

DR. OSCAR FRAAS.

STUTTGART, 7th October, 1866.

NOTICES OF MEMOIRS

I.—NOTES ON THE GEOLOGY OF WESTERN AUSTRALIA.

By the Rev. W. B. CLARKE, M.A., F.G.S., etc.

(Continued from the November No. p. 506.)

The occurrence of felspathic dykes in the granite is quite in accordance with the experience derived from other regions, both in and beyond Australia, as on Bathurst Plains and in other instances in New South Wales, where there is no doubt as to relative age. Moreover, as in other granitic regions, so in that under review, the edges of the boss-like mass can be shown to have been subjected to the influence of the forces by which it has been denuded. Referring still to Mr. Lefroy's testimony, we find an eroded surface in $31^{\circ} 53' \text{ S.}$ and $117^{\circ} 31' \text{ E.}$, and a pot-holed surface in $31^{\circ} 29' \text{ S.}$ and $120^{\circ} 11' \text{ E.}$; whilst, at what must have been the limits of the boss, we have the regular association of gneiss, chlorite, mica, and clay slates on the surface, and at the edges of Mr. Lefroy's and Mr.