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The prehistoeic rock-shelter at Schweizebsbild, near Schaffhausen

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is indeed a complete history of the great basin, the largest of the interior drainage areas of the North American continent. In the publications of the various Surveys of the United States as well as in the official reports of the Canadian Lake Surveys, a vast amount of material exists for any one interested in the study of lakes; in addition, the elaborate special Reports on the great lakes by the Hydrographic Department. Indeed, North America presents an exceptionally favourable field for limnological investigation; if carried out on a systematic method the results could not but be of great scientific interest.

Rivers are of not less geographical interest than lakes, and these have also recently been the subject of special investigation by physical geographers. I have already referred to Professor Davis's study of a special English river-system. The work in the English Lake District by Mr. Marr, spoken of in connection with Dr. Mill's investigations, was mainly on the hydrology of the region. Both in Germany and in Russia special attention is being given to this subject, while in America there is an enormous literature on the Mississippi alone, mainly, no doubt, from the practical standpoint, while the result of much valuable work on the St. Lawrence is buried in Canadian official publications.

But time does not admit of my going further. I might have pointed out the wide and vastly interesting field presented by what the Germans call Anthropogeography, dealing with the interrelations between humanity and its geographical environment. Geography, Mr. Mackinder has said, is the physical basis of history; it is, indeed, the physical basis of all human activity, and from that standpoint the field for geographical research is unbounded. But I can only hint at this. I have endeavoured to indicate what are some of the leading geographical problems of the future, first in order to show at this somewhat critical epoch how very much yet remains to be done, how many important lines of inquiry are open to the geographical student, and that the possibilities of our science are, like those of other departments of research, inexhaustible. My aim has also been to indicate by actual examples what, in the conception of British geographers at least, is the field of our subject. We need not trouble greatly about any precise definition so long as there is such a choice of work for the energies of the geographer. I trust I have been, to some extent at least, successful in the double object which I have had in view in this opening address in a country which presents so splendid a field to the practical geographer.

THE PREHISTORIC ROCK-SHELTER AT SCHWEIZERSBILD, NEAR SCHAFFHAUSEN.

By Professor JAMES GEIKIE, D.C.L., LL.D., F.R.S.

A MOST interesting discovery of prehistoric remains has recently been made by Dr. Nüesch of Schaffhausen. Incited by the accounts of the French, Belgian, and English finds of palæolithic relics in caves and rock-

shelters, Dr. Nüesch began many years ago to search for similar evidence in the numerous limestone-caves of his own canton. The discovery by Mr. C. Merk of the famous Kesserloch, near Thayngen, satisfied Dr. Nüesch that he was on the right track, and between 1872 and 1891 he had perseveringly examined some sixty or seventy likely places, but, unfortunately, with no success. After this he might have been excused had he lost heart; but, stimulated by the discoveries which continued to be made elsewhere, he did not slacken his endeavours, until at last good fortune came to him at the Schweizersbild in his own neighbourhood. The Schweizersbildthal lies some two miles north of Schaffhausen, on the way to Merishausen. It is a pleasant tree-girt meadow, in the midst of which rise some isolated stacks of limestone. From the top of these rocks a wide view is obtained of all the adjacent valleys and heights, so that the place has always been a favourite resort of sportsmen. Here under the overhanging rocks they find shelter from wind and weather, and welcome shade from the noontide sun. No doubt it was for similar reasons that the Schweizersbild commended itself to the old reindeer-hunters whose relics Dr. Nüesch has been so fortunate as to unearth.

At the base of one of the stacks of limestone the explorer began to dig, and underneath a talus of vegetable soil and angular blocks and débris, which last had obviously fallen from the overhanging rock, worked flints, etc., were come upon. Dr. Nüesch, therefore, resolved to have the accumulations carefully and systematically laid bare—an expensive and laborious operation, for which he had himself to undertake the responsibility—the local scientific society being unable to supply the necessary funds. The exploration was commenced in the autumn of 1891, and successfully concluded in 1893. Short notices and papers descriptive of the general results obtained were shortly afterwards published, but it is only now that we have a full and elaborate account from the pen of Dr. Nüesch himself,¹ the delay having arisen partly because of the abundance of materials to be examined, and partly, as we are sorry to learn, because of the severe illness of the author.

In order to give our readers a clear notion of the story told by the deposits in the rock-shelter, we shall first set down here the succession of "beds" with their average thickness. The beds are numbered from the bottom upwards:—

6. Humus-bed : 40—50 cm.
5. Grey Relic-bed : 40 cm.
4. Breccia-bed : average 80 cm. This bed was divided in two by a thin layer (about 10 cm.) termed the Upper Rodent-bed.
3. Yellow Relic-bed : 30 cm.
2. Lower Rodent-bed : 50 cm.
1. Gravel-bed : dug to a depth of some yards.

The lowest bed (1) is of much interest from the fact that it unquestionably belongs to the Glacial Period—Professor Penck and several

¹ "Das Schweizersbild, eine Niederlassung aus paläolithischer und neolithischer Zeit." *Denkschr. d. Schweiz. Naturforschenden Gesellschaft*, Bd. xxxv.

others having conclusively shown that it is a river-deposit formed during the retreat of the great glaciers of the third glacial epoch of Swiss geologists.

The *Lower Rodent-bed* is a yellowish earth, containing many fragments of limestone, and the relics of a very remarkable fauna—such a fauna as we now meet with only in the extreme north-east of Europe and in Northern Siberia, where the characteristic forms are lemmings (*Myodes torquatus*; *M. obensis*), arctic fox, mountain-hare, reindeer, and musk-ox. Such are the most characteristic animals of the Tundra, but along with them are frequently associated northern field-vole, water-rat, glutton, common weasel, ermine, wolf, fox, and bear. Of these fourteen Tundra forms, twelve are met with in the *Lower Rodent-bed* of the Schweizersbild. The only species that do not occur are the Obi lemming and the musk-ox. The former, however, has a somewhat more southern range than the torquated lemming, while the remains of the musk-ox have been met with in the Kesserloch—a cave which occurs in the same neighbourhood. Along with the Tundra mammals of the Schweizersbild various birds were associated, such as ptarmigans, grouse, pin-tail duck, buntings, owls, falcons, etc.—an assemblage quite comparable with the bird-life of the Siberian Tundras. The arctic fox and the torquated lemming are especially characteristic of these far northern regions, and their presence at the Schweizersbild is therefore peculiarly significant. They range as far northwards as land extends, and are met with even in the islands of the frozen ocean. We cannot doubt, therefore, that while the lower portions of the *Rodent-bed* were being slowly accumulated, an arctic climate reigned in North Switzerland.

As the *Rodent-bed* and its contents are more narrowly scanned, it becomes obvious that the climate was beginning to change before the accumulation of the bed was completed. The Tundra fauna was still in possession of the land when representatives of a sub-arctic Steppe fauna began to put in an appearance. Amongst these new-comers were the little hamster (*Cricetus phævus*), common hamster, Siberian social vole, pika or tailless hare, wild horse, and woolly rhinoceros. Thus as we pass from the lower to the upper portion of the bed, a gradual change comes over the fauna—some species disappear, while new arrivals take their place. The extreme arctic conditions, evinced by the presence of a characteristic Tundra fauna, were thus eventually superseded by a climate resembling that of the sub-arctic steppe lands of Europe-Asia.

The most abundant remains in the *Lower Rodent-bed* were those of torquated lemming—"the warmth-hater"—as Middendorf has called it. The bones of this lemming and those of the birds are not broken, as are those of the larger animals. These last occur in small quantity—the most common being those of the alpine hare. Evidence of man's presence is furnished by flint implements, and by awls, chisels, harpoons, and needles fashioned out of bone and horn. Most of the bones appear as if they had been broken with stone-hammers, not a single marrow-bone having escaped such treatment. Throughout the entire thickness of the *Lower Rodent-bed*, however, only one old hearth with its ashes was encountered. From the fact that no burnt bones have been met with,

and from the small number of worked bones and antlers, contrasting so strongly with their abundance in the overlying beds, it is inferred that man was not a persistent occupant of the Schweizersbild rock-shelter during the accumulation of the *Lower Rodent-bed*. This is further suggested by the occurrence, especially in the upper part of that bed, of abundant traces of various birds of prey, which appear to have been able to nest undisturbed on the rock and in its crevices. Probably at that stage the surrounding country had no large leafy trees or pine-forests, and supported merely dwarf bushes and scrub.

The next succeeding layer (the *Yellow Relic-bed*) owes its yellowish-red colour to an admixture of yellow loam, yellow-stained bones, and numerous stones which have been reddened by the action of fire. The whole bed proved to be rich in relics of man. It yielded some 14,000 flint implements, and a large number of worked bones and antlers, comprising needles, bodkins and awls, chisels, harpoons, reindeer-whistles, etc. Bits of wood, worked and charred, and fragments of worked and unworked lignite, were also obtained. Besides these, drawings and patterns were found on reindeer-antlers, on bones, and on tablets of limestone, while many shells, fossils, and teeth of the arctic fox and the glutton were met with, bored and pierced as if they had been used for necklaces and other personal ornaments. The presence throughout the relic-bed of nuclei or cores from which flints had been struck, of abundant chips and splinters, of old hearths, ashes, and burnt bones, of stones discoloured and cracked by the action of fire, all leads to the conclusion that the reindeer-hunters were constant occupants of the Schweizersbild during the accumulation of the *Yellow Relic-bed*. A large number of "fossils," and various minerals, were found scattered through the bed. Some of these have come from no great distance, but others could not have been obtained in Switzerland. Either on account of their shape, their appearance, their colour, their size, or other character, they had somehow taken the fancy of the reindeer-hunters. No doubt some of them were used as ornaments by the men and women, while others may have been playthings for the children. Their presence, however, shows that the hunters sometimes wandered many miles away—to north, west, and east. The occurrence of certain fossils, which in all probability have come from near Mainz and from the neighbourhood of Ulm, seems to show that the valleys of the Rhine and the Danube may have been the "trade-routes" of the period, the fossils being used in barter. The stone implements employed by the reindeer-hunters were not exclusively flint—various other hard rocks were utilised—all of which could be obtained in the immediate neighbourhood. It is interesting to note, too, that slabs of schistose, and other readily split rocks, were found disposed symmetrically round the hearths, as if for seats. Anvils of granite were seen half-buried in chips, splinters, nuclei, and spoilt implements of flint.

Turning to the abundant animal remains, we find that these represent no fewer than forty-nine different species—thirty of which are mammals, fifteen birds, three amphibians, and one fish. Comparing this fauna with that of the *Rodent-bed*, we see that the most characteristic Tundra form—

the torquated lemming—is no longer represented. So, in like manner, no trace is found of lesser shrew, little hamster, bank-vole, alpine vole, Siberian social vole, northern field-vole, parti-coloured bat, rhinoceros, hawk-owl (*Surnia nisoria*), kestrel, etc. On the other hand, many new arrivals make their appearance. Amongst these are Pallas's cat (*Felis manul*), spider musk-shrew, red suslik or sisel (*Spermophilus rufescens*), alpine ibex, Persian maral, kiang or dzegettai, pine marten, beaver, squirrel, red deer, roe-deer, wild boar; various birds, including grouse, fieldfare, golden eagle, alpine lark, etc; and species of toad, frog, and snake.

This is a Steppe fauna, although not quite so characteristic and well marked as the Tundra fauna of the *Lower Rodent bed*. We note the absence of jerboa, but other not less characteristic Steppe animals are present, such as the red suslik, the pika, and the true hamster. As constant visitors of the steppe-lands we note further Pallas's cat, wild horse and dzegettai, and some birds; while associated with these are several representatives of a sub-arctic and alpine fauna, as the arctic fox, glutton, mountain-hare, alpine ibex, and various birds. Amongst this company red deer, roe, wild boar, squirrel, pine marten, and beaver—all belonging to a Forest fauna—seem out of place. It is to be noted, however, that they are represented by very few remains, and further that these are entirely restricted to the uppermost part of the relic-bed, where the division between that bed and the overlying layer was not very sharply defined. Yet a Forest fauna might quite well have been contemporaneous with a Steppe fauna in Switzerland. It is quite possible that some of the lower heights of the neighbourhood may have been covered with a scrub of birch and pine which would give shelter to deer, boars, martens, and squirrels, while bears and gluttons haunted some of the numerous open rock fissures, and owls and falcons nested in the cliffs.

The remains of reindeer are extremely abundant in the *Yellow Relic-bed*—so abundant that Dr. Nüesch estimates that the teeth, jawbones, and phalanges represent 500 individuals. But this estimate is probably too low. It would appear that the old hunters did not carry the entire carcase of a deer into the rock-shelter at the Schweizersbild. They cut it up where they had killed the animal, taking with them only the haunch and the hide, with the feet, and usually the head. Hence ribs, vertebræ, and bones of the pelvis are very seldom met with, while fragments of the skull are not very plentiful. Both full-grown and young individuals are represented—the latter in astonishing numbers, it being computed that about one-third of the entire mass of bones are those of young deer. From this it has been inferred that the reindeer may have been domesticated, or else that the herds were so large that even with his imperfect weapons the hunter could have no difficulty in bringing down the victims he selected. In one of the drawings of reindeer found in the *Yellow Relic-bed*, it may be noted, that double lines are shown passing along the side of the animal as if they were meant to represent a rein.

In fine, we have here a well-marked dwelling-place of the reindeer-hunter of Palæolithic times. The various weapons and tools coming

from the *Lower Rodent-bed* and the *Yellow Relic-bed* are all of the same type—that, namely, which is characteristically represented by the implements found at La Madelaine in the valley of the Vézère in Southern France.

The next succeeding stratum is the *Breccia-bed* with the *Upper Rodent-bed*. The breccia consists of angular fragments of limestone of the size of peas to walnuts, either lying loosely together or cemented by calcareous matter. Where the bed was undisturbed it reached a maximum of 120 cm., and was similar in character throughout. The whole of the materials have no doubt been derived from the gradual weathering of the overhanging rock, and their accumulation implies a long period of time. Relics of man are not so abundantly met with in this stratum as in the *Yellow Relic-bed*. Nevertheless, sporadic splintered bones and flint-chips occurred all through the breccia, and here and there they were even abundant. About midway between the top and bottom of the breccia a layer of dark earth made its appearance in which traces of man's handiwork and remains of rodents were conspicuous; this is the *Upper Rodent-bed*. Dr. Nüesch is of opinion that during the formation of the breccia small groups of reindeer-hunters now and again visited the Schweizersbild, just as had been the case during the formation of the *Lower Rodent-bed* with its Tundra fauna. The assemblage of animal remains occurring in the breccia-bed shows very clearly that the climatic conditions were changing. The steppe climate was passing away and forests were becoming dominant. Amongst the species met with in the *Upper Rodent-bed* are reindeer, hare, pika, squirrel-tailed dormouse, garden dormouse, squirrel, water-rat, various voles, shrews, mole, weasel, ermine, marten, etc. This is obviously a mixed fauna—a few of the steppe animals being still represented, but the larger number of the species are "forest" forms. In short, we may look upon the fauna of the breccia-bed as marking the transition from steppe to forest conditions. During the formation of the breccia the climate was gradually becoming warmer—the forests continuing to increase at the expense of the older steppe flora. The presence of man is indicated not only by split bones and worked flints, but by the ashes of his fires. No objects fashioned of bone and horn, however, were met with.

The *Grey Relic-bed* is the stratum next in succession. This bed varies considerably in character, but is noteworthy for the extraordinary quantity of ashes which it contains. Large blocks of limestone were found round what seems to have been a central fireplace, while slabs of the same rock probably represented an old hearth. Besides these were many fragments of other rocks, together with fossils, shells, worked flints, bones, and antlers, human skeletons, red unglazed potsherds, and other relics of Neolithic man. Traces of at least twenty-two interments were discovered. These graves were sunk into the underlying Palæolithic beds, and naturally enough, therefore, some Palæolithic relics were here and there found in the *Grey Relic-bed*. But in places where no interments had taken place, the latter bed possessed quite a distinctive character, and was clearly recognisable as Neolithic. Many considerations lead Dr. Nüesch to believe that during the long Neolithic period the

Schweizersbild was not occupied as a dwelling-place, but was simply visited from time to time for burial purposes. He thinks it is also highly probable that the great accumulation of ashes in certain places indicates that here Neolithic man sometimes burnt his dead.

The fauna of the *Grey Relic-bed* includes brown bear, badger, marten, wolf, fox, mole, hare, beaver, squirrel, hamster, water-rat, urus, ox (*Bos taurus Brachyceros*), goat, sheep, red deer, roe-deer, reindeer, wild boar, horse, and ptarmigan. Of these badger, wild-cat, hare, urus, ox, goat, and sheep are new-comers, no trace of which is met with in the *Yellow Relic-bed*. Amongst the species present in palæolithic times the following are now wanting: Pallas's cat, arctic fox, ermine, weasel, glutton, spider musk-shrew, field-vole, red suslik, pika, Alpine hare, bison, ibex, kiang, Persian maral, and all the birds with the exception of ptarmigan. The most abundant remains were those of the red deer, after which came those of roe-deer, horse, and ox. Neglecting the reindeer—the remains of which may have been derived from some of the older beds—it is obvious that the fauna of the *Grey Relic-bed* is a true Forest fauna.

Among the Neolithic interments ten were of children—three of these new-born infants, while the others were respectively three months, two years, four years, and seven years old when they died. Two of the infants had been buried with their mothers, and their graves contained no relics, while those of the other children did, the relics consisting of shells and finely finished flint implements. The great care with which the graves have been constructed, and the presence of the ornaments and other valuable objects placed beside his dead little ones, show how strong was Neolithic man's family affection. The new-born infants were laid each within the right arm of its mother, while with the left arm stretched across her breast the latter seemed to hold the little one fast. The examination of the skeletons of fourteen adults shows that during Neolithic times the Schweizersbild was frequented by two distinctly different races. One of these was of fair stature (1600 mm. and more), while the other was much smaller—a true pygmy race. Professor Kollmann, who has described the remains, is quite certain that the dwarflike proportions of the latter have nothing in common with diseased conditions. This, from many points of view, is a highly interesting discovery. It is possible, as Dr. Nüesch suggests, that the widely-spread legend as to the former existence of little men, dwarfs, and gnomes, who were supposed to haunt caves and retired places in the mountains, may be a reminiscence of these Neolithic pygmies.

The highest-lying accumulation—the *Humus-bed*—is an agglomeration of breccia, earth, and rolled stones, through which were scattered various human relics—ancient and modern, such as glazed and unglazed potsherds, fragments of hand-made tiles, of modern bricks and clay-pipes, of glass of all kinds, coloured and colourless, iron nails of old and recent kinds, buttons of metal, bone, and horn, ancient and modern metal rings, bronze needles with and without eyes, beads, etc. Along with these occurred many bones—the relics of hunters' repasts. Amongst these remains were those of domestic cat, beech marten, hare, rabbit, ox, sheep, elk, red deer, roe, domestic pig, horse, pigeon, and goose—a fauna like

that of the present. The elk, it is believed, was an occupant of the neighbourhood during the middle ages.

Dr. Nüesch makes a rough estimate of the time required for the accumulation of the several deposits met with in this most interesting rock-shelter. Assuming that the Neolithic age closed some 4000 years ago, he infers that the "humus-bed" has taken that time for its accumulation. The bed in question has an average thickness of 40 cm., and has accumulated therefore at the rate of 10 cm. in 1000 years. Taking this as the average rate of formation of all the underlying beds, he obtains the following results:—

1. Humus-bed = 4000 years.
2. Grey or Neolithic bed = 4000 years.
3. Breccia-bed = 8000 to 12,000 years.
4. Yellow Relic-bed = 3000 years.
5. Lower Rodent-bed = 5000 years.

The entire series of deposits, 240 to 290 cm. in thickness, thus represent a period of 24,000 to 29,000 years. Too much reliance must not be placed on these estimates, and Dr. Nüesch mentions several considerations which might reduce the period to something like 20,000 years. But they show, at least, that hundreds of thousands of years cannot have elapsed since the first appearance of Palæolithic man at the Schweizersbild.

The Palæolithic remains clearly belong to the later stages of the Old Stone Age—to that known as the "reindeer period." In the Schweizersbild deposits we find no trace of any earlier stage—the story begins abruptly with the last chapter in the history of Palæolithic times. The evidence shows conclusively that the reindeer period in Switzerland did not commence before the great glaciers of the third glacial epoch had retreated from the low grounds. As Swiss geologists recognise only three such epochs, Dr. Nüesch assigns the Schweizersbild Palæolithic beds to post-glacial times. But even in the so-called post-glacial period of the Alpine Lands, the glaciers attained a much greater development than they do now. Large terminal moraines in the valley of the Rhine show that a "post-glacial" glacier flowed as far as Chur, some 45 miles above Lake Constance. Another enormous glacier occupied the Engadine, and reached down the valley of the Inn, as far as the mouth of the Zillertal; and similar large glaciers have left their moraines in all the main valleys of the Alps. It is probable that the palæolithic beds at Schweizersbild belong to this stage of "post-glacial" glaciation. At all events the character of the fauna of the *Lower Rodent-bed* shows that Tundra conditions of climate obtained at the time of the reindeer-hunters' appearance in the low grounds of Switzerland. The researches of Professor Nehring and others have shown that over a wide area in Central Europe, Tundra, Steppe, and Forest conditions have succeeded each other, so that the results obtained at Schweizersbild are quite in keeping with conclusions already arrived at.

The story, so far as it has now been deciphered, is sufficiently interesting. At a time when large glaciers still occupied most of the Alpine valleys, when local ice-sheets and valley-glaciers flourished in the

mountainous parts of our own islands, and a great ice-flow, derived from the snow-fields of Scandinavia, filled up the Baltic area and invaded North Germany and Denmark, the low grounds of what are now the temperate latitudes of Europe were clothed with the sparse vegetation of the Arctic Tundras. At that time those regions were denized by Siberian lemmings, alpine hare, arctic fox, reindeer, musk-ox, and glutton. More or less abundant relics of this fauna are met with over a wide area. The lemming, for example, is now known to have ranged from Southern England and Central France, through Belgium, Switzerland, and Middle Germany, into Russian Poland and Austria—in all of which regions it was native, and not a mere immigrant. The discoveries at Schweizersbild make it quite certain that Palæolithic man was contemporaneous with this Tundra fauna. As time passed, the climate became less severe, and the arctic forms were replaced by jerboas, pouched marmot, bobac, pika, small hamster-rat, various voles, small steppe-lemming, corsac, Pallas's cat, saiga, kiang, and wild horse—a fauna which exactly recalls that of the sub-arctic Steppes of Russia and Siberia. Associated with these were many animals which are not restricted to the Steppes, such as lion, marsh-lynx, hyæna, wolf, fox, ermine, weasel, reindeer, urus, bison, ox, and musk-ox, which last was probably only a winter visitor. Prominent in this group also were mammoth and woolly rhinoceros. It was during this stage that the reindeer-hunters seem to have occupied most continuously the rock-shelters and caves of Switzerland and Western Europe. During the preceding Tundra stage, they only visited Schweizersbild occasionally—perhaps in summer-time. The climate continuing to improve, the true Steppe animals gradually departed, while the Forest forms began to take their place. It was during this transition period that the reindeer-hunter forsook Switzerland. For long before his final departure he had ceased to be a constant occupant of the Schweizersbild rock-shelter, and only visited it from time to time. As the reindeer seems to have been the mainstay of his existence, we may conjecture that it was the increasing scarcity of this animal—the migration of the herds consequent on changing climatic conditions—that led to the retreat of the old hunters. There is nothing in the evidence at Schweizersbild to suggest any hiatus or break between Palæolithic and Neolithic times. The men of the Old Stone Age disappear with the vanishing sub-arctic Steppe fauna, while the men of the New Stone Age enter on the scene with the Forest fauna. There was a gradual transition from the one stage to the other, and it is even quite possible that Neolithic man may have come in contact with some of the last representatives of the Palæolithic race. This, however, is mere conjecture.

Such is a very imperfect outline of the results obtained by Dr. Nüesch. Much interesting evidence has been necessarily passed over, but sufficient has been given to show the importance of this most recent example of cave-research. Dr. Nüesch acknowledges his indebtedness to Professor Penck for assistance in determining the precise relation of the Palæolithic deposits to the accumulations of the Glacial Period; and to Professors Th. Studer of Bern, J. Kollmann of Basel, and A. Nehring

of Berlin, for their careful examination of the organic remains. The author must be congratulated on the great success which has crowned his labours. His work has demonstrated that Tundra, Steppe, and Forest faunas have succeeded each other, thus establishing the truth of inferences already arrived at by Nehring and others. It has shown, likewise, that this faunal succession followed after the retreat of the great glaciers of the third glacial epoch, and that Palæolithic man was certainly contemporaneous in the Alpine Vorland with the Tundra and the Steppe faunas. Further, it introduces us for the first time to a lost race of Neolithic pygmies. Lastly, we have in the Schweizersbild rock-shelter the most complete section yet discovered, showing the exact succession of the several archæological epochs, the Palæolithic, Neolithic, Bronze, and Iron ages. At the Schweizersbild, probably no long interval supervened between the departure of Palæolithic and the advent of Neolithic man. It is even quite possible that the latter arrived before the last of the reindeer-hunters had vanished from Switzerland. From evidence supplied by certain Pyrenean caves, a similar inference has been drawn. But, even if it should afterwards be ascertained beyond any doubt that Palæolithic and Neolithic man came into contact here and there, it would not follow that this was general throughout Europe. We are now assured that Palæolithic man retreated from the low grounds of our continent along with the gradually retiring sub-arctic Steppe fauna, and that Neolithic man came with the succeeding Forest fauna. It seems very likely, therefore, that Neolithic man may have been in full occupation of Southern Europe while Palæolithic man was still hunting the reindeer in France and Central Europe, and it is quite possible that the two races may have touched along the margins of their respective territories. The evidence of the Pleistocene deposits of Western Europe, however, would seem to show that long before Neolithic man entered those regions, Palæolithic man had taken his departure.

ON THE RELATIVITY OF GEOGRAPHICAL ADVANTAGES.¹

By G. G. CHISHOLM, M.A., B.Sc.

I HAVE to apologise for laying before an association for the advancement of science a number of considerations that are for the most part, if not familiar, at least obvious. There is no novelty in the general proposition I desire to review. The drift of all my remarks is summed up by Professor Cunningham in his "Growth of English Industry and Commerce" in a sentence:² "The economic value of the physical characteristics of a country varies greatly at different times." All that I propose to do is to illustrate that general statement under different heads. Still it may not be altogether useless to do so even in an association for the advancement of science, for there are men with minds acute, penetrating, and subtle,

¹ Paper read at the Liverpool meeting of the British Association, September 1896 (extended).

² *Early and Middle Ages*, p. 12.