dry months of August and September in the villages on the lower slopes of the mountain, gradually creep up the precipitous cliffs from tuft to tuft of dried herbage till they gain the grassy table-lands, and raging over the plain eat their way along the edges of the remaining belts of forest; annually scorching, if not burning, the bark and timber of the outside trees, and killing outright the young seedlings. In exceptionally dry seasons even the damper gorges are invaded, and Mr. Whyte describes hundreds of giant trees lying prostrate and piled on each other in all stages of destruction. We are glad to learn that Mr. Johnston, under whose directions Mr. Whyte's exploration was made, has taken steps to prevent a recurrence of such disasters.

Widdringtonia whytei promises to be of great economic value from the excellent quality of its timber for building purposes and furniture. It is easily worked, and is moreover a tree of rapid growth, for Mr. Whyte tells us that in a plantation which he has formed near the residency at Zomba, three-year-old seedlings have already reached a height of ten feet.

Seeds of the new conifer, forwarded by Mr. Whyte, reached this country in 1893, and healthy seedlings have been raised in the Royal Gardens, Kew; in the Botanical Gardens, Edinburgh; in Messrs. Veitch's Nurseries; and in the Zoological Society's Gardens; so that we may hope to see this fine tree ultimately established in Europe.

The existence of a large cedar-like tree on Milanji was first discovered by the Rev. Robert Acland, of the Blantyre Mission, who visited the mountain in 1889 for the purpose of founding a Mission Station. In Mr. Buchanan's narrative of his journey along the southern frontier of Nyasaland (*Proc. R. Geogr. Soc.* 1891, p. 271) it will be found alluded to as "a species of pine-tree" existing in the ravines on the north-eastern slope. In the latter part of 1891, Dr. W. A. Scott and Mr. Henry Brown made the first ascent of Milanji, going up the southern face, and ascertained the existence of large forests of the so-called "pine" at an altitude of 6000 feet above sea-level. A month later Mr. Whyte succeeded in ascending to the trees, and, as already stated, obtained the first specimens which reached this country, and enabled the tree to be classified and described.

When Fort Lister was founded in 1893, the cedar forests were found to come down to a much lower altitude on the north-east slopes of Mt. Milanji, and advantage was at once taken of this to procure a supply of the timber. It was cut up on the spot, and the planks carried to Zomba, where they have been employed for many purposes. When the residency at Zomba was re-roofed with iron this timber was used for the woodwork. There can be, therefore, no question about the value of this discovery.

SCHIAPARELLI ON MARS.

THE following extracts from a translation communicated to *Astronomy and Astro-Physics*, by Prof. W. H. Pickering, are of special interest at the present time, for they set forth Schiaparelli's observations of the planet Mars, and show his views on various Martian phenomena. The original article was contributed by this keen observer to *Natura ed Arte*.

THE POLAR CAPS.

Many of the first astronomers who studied Mars with the telescope, noted on the outline of its disc two brilliant white spots of rounded form and of variable size. In process of time it was observed that whilst the ordinary spots upon Mars were displaced rapidly in consequence of the planet's daily rotation, changing in a few hours both their position and their perspective, that the two white spots remained sensibly motionless at their posts. It was concluded rightly from this, that they must occupy the poles of rotation of the planet, or at least must be found very near to them. Consequently they were given the name of polar caps or spots. And not without reason is it conjectured, that these represent upon Mars an immense mass of snow and ice, similar to that which to-day prevents navigators from reaching the poles of the Earth. We are led to this conclusion not only by the analogy of aspect and of place, but also by another important observation.

As things stand, it is manifest, that if the white polar spots of Mars represent snow and ice, they should continue to decrease in size with the approach of summer in those places, and increase during the winter. Now this very fact is observed in the most evident manner. In the second half of the year 1892 the southern polar cap was in full view; during that interval, and especially in the months of July and August, its rapid diminution from week to week was very evident, even to those observing with common telescopes. This snow (for we may well call it so), which in the beginning reached as far as latitude 70°, and formed a cap of over 2000 kilometres (1200 miles) in diameter, progressively diminished, so that two or three months later little more of it remained than an area of perhaps 300 kilometres (180 miles), at the most, and still less was seen later in the last days of 1892.[1] In these months the southern hemisphere of Mars had its summer; the summer solstice occurring upon October 13. Correspondingly the mass of snow surrounding the northern pole should have increased; but this fact was not observable, since that pole was situated in the hemisphere of Mars which was opposite to that facing the Earth. The melting of the northern snow was seen in its turn in the years 1882, 1884, and 1886.

The southern snow, however, presents this peculiarity, that the centre of its irregularly rounded figure does not coincide exactly with the pole, but is situated at another point, which is nearly always the same, and is distant from the pole about 300 kilometres (180 miles) in the direction of the Mare Erythræum. From this we conclude that when the area of the snow is reduced to its smallest extent, that the south pole of Mars is uncovered; and therefore, perhaps, the problem of reaching it upon this planet is easier than upon the Earth. The southern snow is in the midst of a huge dark spot, which with its branches occupies nearly one-third of the whole surface of Mars, and is supposed to represent its principal ocean. Hence the analogy with our arctic and antarctic snows may be said to be complete, and especially so with the antarctic one.

The mass of the northern snow-cap of Mars is on the other hand centred almost exactly upon its pole. It is located in a region of yellow colour, which we are accustomed to consider as representing the continent of the planet. From this arises a singular phenomenon which has no analogy upon the Earth. At the melting of the snows, accumulated at that pole during the long night of ten months and more, the liquid mass produced in that operation is diffused around the circumference of the snowy region, converting a large zone of surrounding land into a temporary sea, and filling all the lower regions. This produces a gigantic inundation, which has led some observers to suppose the existence of another ocean in those parts, but which does not really exist in that place, at least as a permanent sea. We see then (the last opportunity was in 1884) the white spot of the snow surrounded by a dark zone, which follows its perimeter in its progressive diminution, upon a constantly diminishing circumference. The outer part of this zone branches out into dark lines, which occupy all the surrounding region, and seem to be distributory canals, by which the liquid mass may return to its natural position. This produces in these regions very extensive lakes, such as that designated upon the map by the name of *Lacus Hyperboreus;* the neighbouring interior sea called *Mare Acidalium* becomes more black, and more conspicuous. And it is to be remembered as a very probable thing, that the flowing of this melted snow is the cause which determines principally the hydrographic state of the planet, and the variations that are periodically observed in its aspect. Something similar would be seen upon the Earth, if one of our poles came to be located suddenly in the centre of Asia or of Africa. As things stand at present, we may find a miniature image of these conditions in the flooding that is observed in our streams at the melting of the Alpine snows.

Other white spots of a transitory character, and of a less regular arrangement, are formed in the southern hemisphere, upon the islands near the pole, and also in the opposite hemisphere, whitish regions appear at times surrounding the north pole, and reaching to 50° and 55° of latitude. They are perhaps transitory snows, similar to those which are observed in our latitudes. But also in the torrid zone of Mars are seen some very small white spots more or less persistent. Perhaps we may be permitted to account for these by the existence of a mountain capable of supporting extensive ice-fields. The existence of such a mountain has been supposed also by some recent observers, founded upon other facts.

MARTIAN METEOROLOGY.

As has been stated, the polar snows of Mars prove, in an incontrovertible manner, that this planet, like the Earth, is surrounded by an atmosphere capable of transporting vapour from one place to another. These snows are in fact precipitations of

[1] A note on the melting of the southern snow-cap this year appeared in the last number of NATURE (p. 64).

© 1894 Nature Publishing Group

vapour, condensed by the cold, and carried with it successively. How carried with it, if not by atmospheric movement? The existence of an atmosphere charged with vapour has been confirmed also by spectroscopic observations, principally those of Vogel; according to which this atmosphere must be of a composition differing little from our own, and above all *very rich in aqueous vapour*. This is a fact of the highest importance, because from it we can rightly affirm with much probability, that to water, and to no other liquid is due the seas of Mars and its polar snows. When this conclusion is assured beyond all doubt, another one may be derived from it, of not less importance—that the temperature of the Arean climate, notwithstanding the greater distance of that planet from the Sun, is of the same order as the temperature of the terrestrial one. Because, if it were true, as has been supposed by some investigators, that the temperature of Mars was on the average very low (from 50° to 60° below zero !), it would not be possible for water vapour to be an important element in the atmosphere of that planet, nor could water be an important factor in its physical changes; but would give place to carbonic acid, or to some other liquid whose freezing point was much lower.

The elements of the meteorology of Mars seem then to have a close analogy to those of the Earth. But there are not lacking, as might be expected, causes of dissimilarity. From circumstances of the smallest moment, nature brings forth an infinite variety in its operations. Of the greatest influence must be the different arrangement of the seas and the continents upon Mars, and upon the Earth. We have already emphasised the fact of the extraordinary periodical flood, which at every revolution of Mars inundates the northern polar region at the melting of the snow. Let us now add that this inundation is spread out to a great distance by means of a network of canals, perhaps constituting the principal mechanism (if not the only one) by which water (and with its organic life) may be diffused over the arid surface of the planet. Because on Mars it rains very rarely, *or perhaps even, it does not rain at all.*

The atmosphere of Mars is nearly perpetually clear, and sufficiently transparent to permit one to recognise, at any moment whatever, the contours of the seas and continents, and more than that, even the minor configurations. Not indeed that vapours of a certain degree of opacity are lacking, but they offer very little impediment to the study of the topography of the planet. Here and there we see appear from time to time a few whitish spots, changing their position and their form, rarely extending over a very wide area. They frequent by preference a few regions, such as the islands of the *Mare Australe*, and on the continents, the regions designated on the map with the names of *Elysium* and *Tempe*. Their brilliancy generally diminishes and disappears at the meridian hour of the place, and is reinforced in the morning and evening, with very marked variations. It is possible that they may be layers of cloud, because the upper portions of terrestrial clouds, where they are illuminated by the Sun, appear white. But various observations lead us to think that we are dealing rather with a thin veil of fog, instead of a true nimbus cloud, carrying storms and rain. Indeed it may be merely a temporary condensation of vapour, under the form of dew or hoar-frost.

Accordingly, as far as we may be permitted to argue from the observed facts, the climate of Mars must resemble that of a clear day upon a high mountain. By day a very strong solar radiation hardly mitigated at all by mist or vapour, by night a copious radiation from the soil towards celestial space, and because of that a very marked refrigeration. Hence a climate of extremes, and great changes of temperature from day to night, and from one season to another. And as on the Earth at altitudes of 5000 and 6000 metres (17,000 to 20,000 feet), the vapour of the atmosphere is condensed only into the solid form, producing those whitish masses of suspended crystals, which we call cirrus clouds, so in the atmosphere of Mars, it would be rarely possible (or would even be impossible) to find collections of cloud capable of producing rain of any consequence. The variation of the temperature from one season to another would be notably increased by their long duration, and thus we can understand the great freezing and melting of the snow, which is renewed in turn at the poles at each complete revolution of the planet around the Sun.

Topographical Tints.

In its general topography Mars does not present any analogy with the Earth. A third of its surface is occupied by the great *Mare Australe*, which is strewn with many islands, and the continents are cut up by gulfs and ramifications of various forms. To the general water system belongs an entire series of small internal seas, of which the Hadriacum and the Tyrrhenum communicate with it by wide mouths, whilst the Cimmerium, the Sirenum, and the Solis Lacus are connected with it only by means of narrow canals. We shall notice in the first four a parallel arrangement, which certainly is not accidental, as also not without reason is the corresponding position of the peninsulas of Ausonia, Hesperia, and Atlantis. The colour of the seas of Mars is generally brown, mixed with grey, but not always of equal intensity in all places, nor is it the same in the same place at all times. From an absolute black it may descend to a light grey, or to an ash colour. Such a diversity of colours may have its origin in various causes, and is not without analogy also upon the Earth, where it is noted that the seas of the warm zone are usually much darker than those nearer the pole. The water of the Baltic, for example, has a light, muddy colour, that is not observed in the Mediterranean. And thus in the seas of Mars we see the colour become darker when the sun approaches their zenith, and summer begins to rule in that region.

All of the remainder of the planet, as far as the north pole, is occupied by the mass of the continents, in which, save in a few areas of relatively small extent, an orange colour predominates, which sometimes reaches a dark red tint, and in others descends to yellow and white. The variety in this colouring is in part of meteorological origin, in part it may depend on the diverse nature of the soil, but upon its real cause it is not as yet possible to frame any very well-grounded hypothesis. Some have thought to attribute this colouring to the atmosphere of Mars, through which the surface of the planet might be seen coloured, as any terrestrial object becomes red, when seen through red glass. But many facts are opposed to this idea, among others, that the polar snows appear always of the purest white, although the rays of light derived from them traverse twice the atmosphere of Mars under great obliquity. We must then conclude that the Arean continents appear red and yellow, because they are so in fact.

Besides these dark and light regions, which we have described as seas and continents, and of the nature of which there is at present scarcely left any room for doubt, some others exist, truly of small extent, of an amphibious nature, which sometimes appear yellowish like the continents, and are sometimes clothed in brown (even black in certain cases), and assume the appearance of seas, whilst in other cases their colour is intermediate in tint, and leaves us in doubt to which class of regions they may belong. Thus, all the islands scattered through the Mare Australe and the Mare Erythræum belong to this category, so too the long peninsula called Deucalionis Regio and Pyrrhæ Regio, and in the vicinity of the Mare Acidalium the regions designated by the names of Baltia and Nerigos. The most natural idea, and the one to which we should be led by analogy, is to suppose these regions to represent huge swamps, in which the variation in depth of the water produces the diversity of colours.

Not without reason, then, have we hitherto attributed to the dark spots of Mars the part of seas, and that of continents to the reddish areas which occupy nearly two-thirds of all the planet, and we shall find later other reasons which confirm this method of reasoning. The continents form in the northern hemisphere a nearly continuous mass, the only important exception being the great lake called the Mare Acidalium, of which the extent may vary according to the time, and which is connected in some way with the inundations which we have said were produced by the melting of the snow surrounding the north pole. To the system of the Mare Acidalium undoubtedly belong the temporary lake called Lacus Hyperboreus and the Lacus Niliacus. This last is ordinarily separated from the Mare Acidalium by means of an isthmus or regular dam, of which the continuity was only seen to be broken once for a short time in 1888. Other smaller dark spots are found here and there in the continental area, which we may designate as lakes, but they are certainly not permanent lakes like ours, but are variable in appearance and size according to the seasons, to the point of wholly disappearing under certain circumstances. Ismenius Lacus, Lunæ Lacus, Trivium Charontis and Propontis are the most conspicuous and durable ones. There are also smaller ones, such as Lacus Mœris and Fons Juventæ, which at their maximum size do not exceed 100 to 150 kilometres (60 to 90 miles) in diameter, and are among the most difficult objects upon the planet.

© 1894 Nature Publishing Group

THE CANALS OR CHANNELS.

All the vast extent of the continents is furrowed upon every side by a network of numerous lines or fine stripes of a more or less pronounced dark colour, whose aspect is very variable. These traverse the planet for long distances in regular lines, that do not at all resemble the winding courses of our streams. Some of the shorter ones do not reach 500 kilometres (300 miles), others on the other hand extend for many thousands, occupying a quarter or sometimes even a third of a circumference of the planet. Some of these are very easy to see, especially that one which is near the extreme left-hand limit of our map, and is designated by the name of Nilosyrtis. Others in turn are extremely difficult, and resemble the finest thread of spider's web drawn across the disc. They are subject also to great variations in their breadth, which may reach 200 or even 300 kilometres (120 to 180 miles) for the Nilosyrtis, whilst some are scarcely 30 kilometres (18 miles) broad.

These lines or stripes are the famous canals of Mars, of which so much has been said. As far as we have been able to observe them hitherto, they are certainly fixed configurations upon the planet. The Nilosyrtis has been seen in that place for nearly one hundred years, and some of the others for at least thirty years. Their length and arrangement are constant, or vary only between very narrow limits. Each of them always begins and ends between the same regions. But their appearance and their degree of visibility vary greatly, for all of them, from one opposition to another, and even from one week to another, and these variations do not take place simultaneously and according to the same laws for all, but in most cases happen apparently capriciously, or at least according to laws not sufficiently simple for us to be able to unravel. Often one or more become indistinct, or even wholly invisible, whilst others in their vicinity increase to the point of becoming conspicuous even in telescopes of moderate power.

Every canal[1] (for now we shall so call them) opens at its ends, either into a sea, or into a lake, or into another canal, or else into the intersection of several other canals. None of them have yet been seen cut off in the middle of the continent, remaining without beginning or without end. This fact is of the highest importance. The canals may intersect among themselves at all possible angles, but by preference they converge towards the small spots to which we have given the name of lakes. For example, seven are seen to converge in Lacus Phœnicis, eight in Trivium Charontis, six in Lunæ Lacus, and six in Ismenius Lacus.

The normal appearance of a canal is that of a nearly uniform stripe, black, or at least of a dark colour, similar to that of the seas, in which the regularity of its general course does not exclude small variations in its breadth, and small sinuosities in its two sides. Often it happens that such a dark line opening out upon the sea is enlarged into the form of a trumpet, forming a huge bay, similar to the estuaries of certain terrestrial streams. The Margaritifer Sinus, the Aonius Sinus, the Auroræ Sinus, and the two horns of the Sabæus Sinus are thus formed, at the mouths of one or more canals, opening into the Mare Erythræum or into the Mare Australe. The largest example of such a gulf is the Syrtis Major, formed by the vast mouth of the Nilosyrtis, so called. This gulf is not less than 1800 kilometres (1100 miles) in breadth, and attains nearly the same depth in a longitudinal direction. Its surface is little less than that of the Bay of Bengal. In this case we see clearly the dark surface of the sea continued without apparent interruption into that of the canal. Inasmuch as the surfaces called seas are truly a liquid expanse, we cannot doubt that the canals are a simple prolongation of them, crossing the yellow areas or continents.

Of the remainder, that the lines called canals are truly great furrows or depressions in the surface of the planet, destined for the passage of the liquid mass, and constituting for it a true hydrographic system, is demonstrated by the phenomena which are observed during the melting of the northern snows. We have already remarked that at the time of melting they appeared surrounded by a dark zone, forming a species of temporary sea. At that time the canals of the surrounding region become blacker and wider, increasing to the point of converting, at a certain time, all of the yellow region comprised between the edge of the snow and the parallel of 60° north latitude, into numerous islands of small extent. Such a state of things does not cease, until the snow, reduced to its minimum area, ceases to melt. Then the breadth of the canals diminishes, the temporary sea disappears, and the yellow region again returns to its former area. The different phases of these vast phenomena are renewed at each return of the seasons, and we have been able to observe them in all their particulars very easily during the oppositions of 1882, 1884, and 1886, when the planet presented its northern pole to terrestrial spectators. The most natural and the most simple interpretation is that to which we have referred, of a great inundation produced by the melting of the snows—it is entirely logical, and is sustained by evident analogy with terrestrial phenomena. We conclude, therefore, that the canals are such in fact, and not only in name. The network formed by these was probably determined in its origin in the geological state of the planet, and has come to be slowly elaborated in the course of centuries. It is not necessary to suppose them the work of intelligent beings, and notwithstanding the almost geometrical appearance of all of their system, we are now inclined to believe them to be produced by the evolution of the planet, just as on the Earth we have the English Channel and the Channel of Mozambique.

[1] The correct translation of the Italian word *canale*, used with reference to the streaks on Mars, is channel or strait, and not canal.

THE GEMINATION OF THE CANALS.

The most surprising phenomenon pertaining to the canals of Mars is their gemination, which seems to be produced principally in the months which precede, and in those which follow the great northern inundation, at about the times of the equinoxes. In consequence of a rapid process, which certainly lasts at most a few days, or even perhaps only a few hours, and of which it has not yet been possible to determine the particulars with certainty, a given canal changes its appearance, and is found transformed through all its length, into two lines or uniform stripes, more or less parallel to one another, and which run straight and equal with the exact geometrical precision of the two rails of a railroad. But this exact course is the only point of resemblance with the rails, because in dimensions there is no comparison possible, as it is easy to imagine. The two lines follow very nearly the direction of the original canal, and end in the place where it ended. One of these is often superposed as exactly as possible upon the former line, the other being drawn anew, but in this case the original line loses all the small irregularities and curvature that it may have originally possessed. But it also happens that both the lines may occupy opposite sides of the former canal, and be located upon entirely new ground. The distance between the two lines differs in different geminations, and varies from 600 kilometres (360 miles) and more, down to the smallest limit at which two lines may appear separated in large visual telescopes—less than an interval of 50 kilometres (30 miles). The breadth of the stripes themselves may range from the limit of visibility, which we may suppose to be 30 kilometres (18 miles), up to more than 100 kilometres (60 miles). The colour of the two lines varies from black to a light red, which can hardly be distinguished from the general yellow background of the continental surface. The space between is for the most part yellow, but in many cases appears whitish. The gemination is not necessarily confined only to the canals, but tends to be produced also in the lakes. Often one of these is seen transformed into two short, broad, dark lines parallel to one another, and traversed by a yellow line. In these cases the gemination is naturally short, and does not exceed the limits of the original lake.

The gemination is not shown by all at the same time, but when the season is at hand, it begins to be produced here and there, in an isolated, irregular manner, or at least without any easily recognisable order. In many canals (such as the Nilosyrtis for example) the gemination is lacking entirely, or is scarcely visible. After having lasted for some months, the markings fade out gradually and disappear until another season equally favourable for their formation. Thus it happens that in certain other seasons (especially near the southern solstice of the planet) that few are seen, or even none at all. In different oppositions the gemination of the same canal may present different appearances as to width, intensity and arrangement of the two stripes, also in some cases the direction of the lines may vary, although by the smallest quantity, but still deviating by a small amount from the canal with which they are directly associated. From this important fact it is immediately understood that the gemination cannot be a fixed formation upon the surface of Mars, and of a geographical character like the canals.

The observation of the geminations is one of the greatest difficulty, and can only be made by an eye well practised in

© 1894 Nature Publishing Group

such work, added to a telescope of accurate construction and of great power. This explains why it is that it was not seen before 1882. In the ten years that have transpired since that time, it has been seen and described at eight or ten observatories. Nevertheless, some still deny that these phenomena are real, and tax with illusion (or even imposture) those who declare that they have observed it.

EXPLANATIONS OF THE GEMINATION OF CANALS.

Having regard then to the principle that in the explanation of natural phenomena, it is universally agreed to begin with the simplest suppositions, the first hypotheses on the nature and cause of the geminations have for the most part put in operation only the laws of inorganic nature. Thus the gemination is supposed to be due either to the effects of light in the atmosphere of Mars, or to optical illusions produced by vapours in various manners, or to glacial phenomena of a perpetual winter, to which it is known all the planets will be condemned, or to double cracks in its surface, or to single cracks of which the images are doubled by the effect of smoke issuing in long lines and blown laterally by the wind. The examination of these ingenious suppositions leads us to conclude that none of them seem to correspond entirely with the observed facts, either in whole or in part. Some of these hypotheses would not have been proposed had their authors been able to examine the geminations with their own eyes.

It is far easier to explain the gemination if we are willing to introduce the forces pertaining to organic nature. Here the field of plausible supposition is immense, being capable of making an infinite number of combinations capable of satisfying the appearances even with the smallest and simplest means. Changes of vegetation over a vast area, and the production of animals, also very small, but in enormous multitudes, may well be rendered visible at such a distance. An observer placed in the moon would be able to see such an appearance at the times in which agricultural operations are carried out upon one vast plain—the seed time and the gathering of the harvest. In such a manner also would the flowers of the plants of the great steppes of Europe and Asia be rendered visible at the distance of Mars—by a variety of colouring. A similar system of operations produced in that planet may thus certainly be rendered visible to us. But how difficult for the Lunarians and Areans to be able to imagine the true causes of such changes of appearance, without having first at least some superficial knowledge of terrestrial nature! So also for us, who know so little of the physical state of Mars, and nothing of its organic world, the great liberty of possible supposition renders arbitrary all explanations of this sort, and constitutes the gravest obstacle to the acquisition of well-founded notions. All that we may hope is that with time the uncertainty of the problem will gradually diminish, demonstrating, if not what the geminations are, at least what they cannot be. We may also confide a little in what Galileo called "the courtesy of nature," thanks to which, sometimes from an unexpected source, a ray of light will illuminate an investigation at first believed inaccessible to our speculations, and of which we have a beautiful example in celestial chemistry. Let us therefore hope and study.

EARLY BRITISH RACES.[1]

II.

IN continental caves human skeletons of this period have been found; of these, perhaps, the best known is the famous Neanderthal one, from a cave near Düsseldorf. Upon this skeleton alone it would not have been prudent to have based the characters of Palæolithic cave men, because the circumstances under which it was found have given rise to some doubt as to its being of this age, and it is by some considered to belong to the next period which we have to deal with. When it is taken in conjunction with others presenting similar characters, regarding which there is no doubt as to the age to which they belong, the evidence it affords is considerably strengthened. The find of two skeletons at Spey (in Belgium) in 1886, has been most important, both in advancing our knowledge and confirming the characters ascribed to this race from various less complete specimens. The cranium of the Neanderthal skeleton, though very imperfect, is long and proportionately narrow in form, having a cephalic index of 72, the glabella, brow ridges, and external orbital processes are enormously developed, the forehead is remarkably flattened, the occiput is prominent, and the elevation of the whole vault is extremely low. The skulls of both the Spey skeletons are also long and narrow, one having a cephalic index of 70, and the other of 74·6; the superciliary ridges and also the glabella are very prominent; the frontal sinuses are large, the external orbital processes are thick and projecting, the ridges on the frontal, parietal, and temporal bones for muscular attachments are strongly developed; the occiput is prominent with a well-marked "torus" at the junction of the curved muscular ridges, which are also large; the cranial vault is low and flattened from above downwards, and presents an antero-posterior curve very similar to the outline of the side of an ellipse. The malar bones have thick and broad orbital processes, the orbital cavities are deep, and the orbital breadth is but slightly inferior to the width; the zygomatic arches are large. The size of the lower molar teeth increases from before backwards, the first molar being the smallest, and the wisdom or last molar the largest. The lower jaw shows no prominence of the chin; indeed, it recedes somewhat from the alveolar border downwards, and has a symphesial angle of 111°. It is thus a counterpart of the Naulette mandible, which presents similar characters, both as regards the molars and symphesial angle. The stature of the Neanderthal skeleton, estimated from the length of the femur, is 1·604 metres (5 ft. 3 in.), and from the humerus 2 cm. less; that of the Spey skeleton (there being only one of these in which the long bones could be measured), estimated from the femur and tibia, is 1·504 metres (4 ft. 11½ in.), and from the femur alone, 1·540 metres (5 ft. 0¾ in.). The stature of the Naulette skeleton, that of a woman, estimated from the ulna, is 1·433 metres (4 ft. 4½ in.), and shows that she also was very short.

The long bones of both upper and lower limbs of the Neanderthal skeleton are characterised by their unusual thickness, and the great development of the elevations and depressions for the attachment of muscles, the articular ends of the femur are also of larger size than usual. The femur of the Spey skeleton is more arched forward than usual, it is somewhat flattened from side to side in section, and the articular ends are of large size, especially the lower, in which there is enormous antero-posterior development of the articular surface of the condyles. The tibia is actually and proportionately very short, flattened laterally, and therefore platycnemic. The bones generally are remarkable for their stoutness, and indicate that the muscles attached to them were large and powerful, especially those of the lower limb. In respect to the platycnemism of the tibia, the Spey skeleton corresponds to the Langerie Basse and Madelaine bones from the Perigord Caves, and confirms in a very positive manner the evidence of their surroundings and relicts that Palæolithic people were sons of the chase, as it is connected with the development of the tibialis posticus muscle, and not a race character.

Portions of skulls and skeletons found in various parts of the continent, associated with Palæolithic implements and animal remains of late Pleistocene times, support the peculiar race characters of the specimens just described. The osteological remains of Palæolithic age now in hand from different parts of the continent seem to me to afford sufficient evidence of the existence, both in drift and in cave deposits, of a race of men possessing physical characters quite distinct from those of the Neolithic period, which we will next consider. The assertions which have been made at various times with respect to individual specimens being more or less pathological, will, to my mind, not hold good when we find specimen after specimen from the same deposits showing similar characters. It may not be possible, in some cases, to establish the fact that the specimen cannot have been deposited at a later period in the stratum in which it is found, but a careful examination of each specimen, such, for example, as Prof. Topinard has made of the mandible from Naulette, shows anatomical conditions which, not in one respect but in several, indicate as distinctly as his implements the progress of man's evolution, and preclude the idea of this type being a variety of the Neolithic people. The specimens of Palæolithic man seem to me to show identity of race, whether they have been found in the river-drift or in the Palæolithic stratum of caves. The idea of Prof. Boyd Dawkins, that the implements found in the river-drifts and later Palæolithic deposits of caves, give evidence of there being two Palæolithic races, is not supported by the osteological remains yet to hand. From extensive examination of ancient British skeletons,

[1] Continued from p. 70.

© 1894 Nature Publishing Group