GENERAL REMARKS UPON THE SERIES OF PREHISTORIC CRANIA,

BY

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A LARGE series of skulls from prehistoric burial-places in the north of England, and chiefly in the East Riding of Yorkshire, having, together with many others from other localities, been presented to the Oxford University Museum by the Rev. William Greenwell, F.S.A., I undertook to select a certain number of these skulls for figuring and description. There is room for the addition of some general remarks to the account contained in the preceding pages 559–623 of the craniography of the skulls thus selected, a considerable quantity of additional material having come into our hands during the time which has elapsed since the commencement of this work.

A craniographer with Canon Greenwell's series before his eyes in a *coup-d'œil* view would be impressed with the fact that out of the series, two sets, the one by its length typically illustrative of the dolicho-cephalic, the other by its breadth as typically illustrative of the brachy-cephalic form of skull, could at once be selected, even by a person devoid of any special anatomical knowledge. An antiquary similarly inspecting this series with a knowledge of its archæological history would, if he separated it into two groups, the one containing all the skulls of the stone and bone age, the other containing all those of the bronze period, perceive that, while the latter group comprised both dolicho-cephalic and brachy-cephalic crania and in very nearly equal proportions, none but dolicho-cephalic skulls were to be found in any set of skulls from the barrows of the premetallic period [1].

[1] Sir Wm. Wilde, in a lecture on the Ethnology of the Ancient Irish, delivered at the College of Physicians in 1844 and originally published in the Dublin Literary Journal, promulgated the idea that two races, one dolicho-cephalic, the other a round or globular headed race, existed in that country in the earliest times, apparently simultaneously. Examples of both races, but especially of the former, he thought were still to be found among the modern Irish. The evidence before Sir Wm. Wilde is

Facts of nearly equal generality and obviousness would be presented in the observation of the comparative rarity of the inter-

given at pp. 40, 228–232 of his 'Beauties of the Boyne and Blackwater,' the second edition of which was published in 1850. In this year Professor Daniel Wilson, in a paper read before the British Association and published in the Transactions of the Sections for 1850, p. 142, put forward the following statement as to the succession of races in Scotland, in opposition to the views of Professor Nilsson which may be found in the British Association Report for 1847 at p. 31: 'The earliest Scottish race differed entirely from the earliest Scandinavian race as described by Professor Nilsson, being rather *dolicho-cephalic*, or perhaps more correctly *cymbo-cephalic*, to adopt a term which I venture to suggest as most appropriate to the peculiar *boat-like* shape of the crania. . . . . The second race decidedly corresponds with the *brachy-cephalic* of Retzius, though in the few examples I have been able to obtain the cerebral development appears considerably greater than in the primitive race of Scandinavia.' These races Professor Daniel Wilson appears to have considered to be Preceltic; and of the 'true Celtic type,' he says, 'nearly all ethnologists are agreed in assigning to it an intermediate form, shorter than the true *dolicho-cephalic* and longer than the *brachy-cephalic*.' These views were expounded by him at greater length in the first edition of his 'Prehistoric Annals of Scotland,' pp. 163-187, 695-696, which was published next year; *cit.* Nott and Gliddon, 'Indigenous Races,' p. 293. With Professor Wilson's conclusion that the earliest race in Great Britain was eminently dolicho-cephalic, and I would add exclusively so, all archæological anatomists are now agreed; and the tendency to extend this conclusion to other regions of the world's surface is now so strong as to have suggested a comparison between the progress from dolicho-cephaly to brachy-cephaly, which is taken for granted, and the gradual widening of the skull which, it is asserted, takes place between childhood and adult age in modern races. See Schaafhausen, Urform menschl. Schädels, p. 5, 1868, or as *cit.* Welcker, Archiv für Anthropologie, i. p. 151, 1866.

Professor Wilson's views were adopted by Mr. Bateman in his 'Ten Years' Diggings,' p. 147, published in 1861; and he himself reaffirmed them in his paper on 'Ethnical Forms and Undesigned Artificial Distortions of the Human Crania,' published in the Canadian Journal, No. xli. Sept. 1862, p. 41, and in his paper on 'Ancient British Skull Forms,' published in the Edinburgh Philosophical Journal, vol. xviii. July, 1863, p. 62 *seqq.*

Still Professor Nilsson's views as to the priority of the brachy-cephalic races maintained their hold upon the beliefs of the great majority of at least continental anthropologists until the publication of Dr. Thurnam's memoir on 'The Principal Forms of Ancient British and Gaulish Skulls' in 1865, in the Memoirs of the London Anthropological Society.

Professor Broca, Bull. Soc. Anth. Paris, ser. ii. tom. viii. 1873, p. 827, in his memoir 'Sur les crânes de Solutrè,' thus sums up the present state of opinion upon this question: 'En effet dans les gisements les plus anciens de l'Europe occidentale, tous les crânes sont dolicho-céphales, et dans les gisements moins anciens qui ne remontent qu'à l'âge du renne, la dolicho-céphalie est encore la règle la plus générale; quelques faits, il est vrai, établissent qu'à cette dernière époque il y avait en outre un race au crâne plus arrondi;' some Solutrè, like some Hungarian, skulls contravening this rule.

I do not know what foundation there may be for the statement of Professor Canestrini, given by Mr. Darwin, 'Descent of Man,' p. 39, second edition, to the effect that brachy-cephalic crania have been found in the Drift. The cranium from Olmo in the valley of the Arno, supposed to belong to the post-pliocene age, was said to be brachy-cephalic, but has been shown by Professor Broca to have an index of 72·72, i.e. to be distinctly dolicho-cephalic. See his Mémoires, Tom. ii. p. 354, 1874.

Professor Nilsson, in the third edition of his 'Primitive Inhabitants of Scandinavia,' the first edition of which was published in 1838, says at p. 121 of the English translation, edited by Sir John Lubbock, 1868, 'Some isolated brachy-cephalous crania have

mediate forms, the 'Misch-Formen' of the German anthropologists, in the slightness and shortness of many of the limb bones of the skeletons of the earlier periods, in the very frequent appearance of a certain 'ill-filledness' in the skulls appertaining to those skeletons, and an equally frequent ruggedness in the skulls of the later ages, and finally in the presence, in both series, of skulls which, while retaining their respective type, were very much smaller than the great majority of those classified with them.

Questions of some difficulty as to the affinities of these two sets of crania to those of contemporaneous, of succeeding, and of still existing races of mankind, are suggested by an inspection of them in connexion with some other skulls; and with these questions is intimately connected the choice of the name, whether 'Iberian' or 'Silurian,' 'Brigantian' or 'Cimbric,' which we may for the sake of convenience impose upon the one or the other variety of skull.

The effects which the mode of life possible to the inhabitants of this country in the earlier and indeed also in the later of the two periods of stone and of bronze, with which we have to deal, exercised upon their bodily structure, form a further subject for thought and enquiry, the materials for the prosecution of which however, being

been occasionally found in our stone sepulchres; but it may be taken for granted that the people who constructed these sepulchres belonged to one of the dolicho-cephalous races which still inhabit the greater part of the country.'

Baron von Düben (Compte Rendu-Congrès internat. d'Anthropologie, Stockholm, 1874, tom. ii. 1876, p. 691), speaking of these brachy-cephalous skulls, says, 'Parmi les cent crânes que j'ai examinés du Danemark et de la Suède il s'en trouve une dizaine de cette forme dont 5 du Danemark et le reste de la Suède depuis la Scanie jusqu'en Vestergötlande. Ils ont tous été exhumés des tombeaux de l'âge de la pierre, les crânes sont très arrondis, très courts d'un indice allant jusqu'à 84·2. Grâce à cette forme ils contrastent au premier abord et fortement avec les autres crânes qui sont dolicho-céphales, et évidemment ils appartiennent à une race différente. Ce sont les crânes que MM. Nilsson et A. Retzius ont attribués aux Lapons; et certainement quelques uns de ces crânes ressemblent tellement à ceux des Lapons que nos connaissances crâniologiques actuelles ne suffisent pas pour y constater des différences. Cependant d'autres faits montrent que les Lapons ont immigré par le nord de la Baltique et qu'ils n'ont jamais habité la péninsule Scandinave audessons du 62°. Par cette raison il faut attendre avant de décider sur ce point. Au reste si ce sont des Lapons il se peut très-bien qu'ils soient arrivés comme esclaves ou comme amis de la race dolicho-céphale établie de l'autre côté de la Baltique où vraisemblablement ont existé aux temps préhistoriques des relations intimes entre les Lapons et les races gothiques.'

As already stated, p. 589, there appear to me, so far as an examination of various casts, figures, and descriptions enables me to form an opinion, to be two forms of brachy-cephalic skulls reported to have been found in Danish tumuli of the stone period. I cannot however perceive any close resemblance between either of these forms and that of any one of several Lapp crania which the University Museum owes to the kindness of Professor Eichwald and Mr. A. J. Evans, F.S.A., of Brasenose College. See also *infra*, p. 665.

limited to the bones and teeth, are, from the point of view of a pathologist, comparatively scanty. Something has also to be said as to the sources whence the food of these races came, whether from domestic or from wild animals exclusively, or in combination with each other and with agricultural produce.

It will be convenient to begin by saying that I should speak of the crania of the long barrow period, not as belonging to the 'Iberian[1],' as it is becoming the fashion to style them, but as belonging to the 'Silurian' type; and the brachy-cephalic crania of the round barrow I should similarly speak of, not as belonging to a 'Ligurian,' but to the 'Cimbric' type.

Tacitus, Agricola, xi, tells us that there was a tribe of people called Silures living in the district which we know now as the South Welsh counties of Glamorgan, Monmouth, Brecknock, Hereford, and Radnor; he tells us further, as a matter of fact, that the complexion and hair of this tribe could be described as 'colorati vultus, torti plerumque crines,' words which Jornandes alters slightly, making them a little clearer but perhaps less accurate, as (Get. 2) 'Silurum colorati vultus, torto plerumque crine et nigro nascuntur.' And we know that the black-haired type of the West of England at the present day[2] is shorter in stature and feebler in development, and at the same time longer in skull-form than the lighter haired and lighter complexioned variety. Therefore the longer skulls found with shorter skeletons, but in the long barrows and there to the exclusion of brachy-cephalic forms, I should speak of as belonging to this 'Silurian' type.

The brachy-cephalic skulls of the bronze period which, as already stated, are found in the round barrows mixed up with long skulls, I shall speak of as belonging to a 'Cimbric' type; firstly, because there is no doubt that a similar form of skull is found at the present day to be the skull form of the inhabitants of Denmark,

[1] The earliest paper with which I am acquainted in which this name was adopted for one division of the population of Great Britain is a paper, not without its merits, by Dr. Hibbert Ware, to be found in the Proceedings of the Royal Society of Edinburgh, vol. i. March 4, 1844. Keyser, in a letter of date April 21, 1847, addressed to Retzius and published by him in Müller's Archiv, 1849, or see Ethnol. Schrift. p. 103, 1864, suggests that the Iberians may have been the primitive stone age inhabitants of Great Britain and Ireland. This stock was then considered to be Turanian and brachy-cephalic. Weinhold, who in his 'Altnordisches Leben' had called the stone-age race 'Finnish,' adopted the name 'Iberian' in his memoir 'Die heidnische Todtenbestattung in Deutschland,' published in the Sitzungsberichte d. K. Akad. d. W. phil. hist. Cl. Wien. bd. xxix. hft. 2. p. 131.

[2] Dr. Beddoe, Mem. Anth. Soc. vol. ii. p. 350.

once called the 'Cimbric' Peninsula[1]; and, secondly, because, as I have elsewhere pointed out[2], there are other reasons for thinking

[1] Dr. Beddoe, Mem. Anth. Soc. vol. iii, and Handelman und Pansch, Moorleichenfunde, p. 26. The skull-form of the Danes was eminently brachy-cephalic 800 years ago also, if we may judge from the skulls of Flambard and some other distinguished ecclesiastics of the early Norman period in this country. These skulls were exhumed, and, after being measured by me, reinterred in the course of certain excavations close to the cathedral in Durham in 1874. The skulls of the Anglo-Saxon interments disturbed in these excavations were of the dolicho-cephalic type usual in that race.

[2] See British Association Report for 1875, Bristol Meeting, pp. 148-149, where it is suggested that in addition to the *à priori* probability which the fact of so many immigrations from Denmark into Great Britain having taken place in the way of invasions in historic times lends to such a view, we have some more definite likelihood given to it by the discovery in Yorkshire of monoxylic coffins with similar contents and fashion to those found in South Jutland; and by the existence in the same country of earth-works, which remind us of the 'castra ac spatia' of the Cimbri in their native land (Tacit. Germ. 37), but which have been shown by Colonel Lane Fox to have been thrown up by invaders advancing inland from the sea. I was not aware when I made these suggestions that Münch in his 'Det Norske Folks Historie,' p. 11, German translation by Claussen, 1853, had drawn an argument for the same suggestion from the words of Ammianus Marcellinus, xv. 9, relating to one of the 'Cimbric Deluges,' taken in connexion with the well-known words of the Welsh Triad, 4. p. 57, *cit.* Sharon Turner, History of the Anglo-Saxons, vol. i. book i. chap. ii. and iii. pp. 32, 42, 48 and 49, 7th ed. 1852, which say that Hu Gadarn 'led the nation of the Cymry first to the isle of Britain; and from the country of Summer which is called Deffrobani they came; this is where Constantinople is; and *through the hazy ocean* (the German Ocean) they came to the island of Britain.' Whatever may be the value of these words from the Triad, it is of importance to recollect that there are geological reasons for holding that the so-called 'Cimbrian Deluge' was but one of a series of submersions each of which may have caused an emigration. Sir Charles Lyell has recorded an opinion to this effect in his Principles of Geology, vol. i. pp. 558, 559, citing the traditions recorded by Strabo, vii. 2, and Florus, iii. 3, as to the occurrence of such catastrophes in the Cimbric Peninsula, and in 'extremis Galliæ.' Other references to the Cimbric Deluge will be found in Professor Nilsson's Early Inhabitants of Scandinavia, ed. Lubbock, pp. 252-259, in Maack's Das urgeschichtlich Schleswig-Holstein Lande, Berlin, 1860, also in Koner's Zeitschrift für Erdkunde; in Pallmann's Die Cimbern und Teutonen, Berlin, 1870, pp. 27, 28, 32, and Duncker's Origines Germanicæ, 1840, p. 99. It may be well here to give the exact words of Ammianus Marcellinus, which, as he is not referred to by Sir Charles Lyell, are not so well known to English readers as they deserve to be. Writing of the Gauls he says, xv. 9. 4, p. 56, ed. Eyssenhardt, Berlin, 1871, 'Drasidae memorant se vera fuisse populi partem indigenam, sed alios quoque ab insulis extimis confluxisse et tractibus transrhenanis, crebritate bellorum et adluvione fervidi maris sedibus suis expulsos.' Münch supposes that two waves of population passed over into Britain from the Continent in prehistoric times, and that the Gael were the earlier and the Cymry were the later in order of invasion. This view, or one closely approximating to it, is the one usually taken by writers on this subject, as for example by the present Bishop of St. David's (Vestiges of the Gael in Gwynedd, p. 48, 1851), and by Niebuhr (History of Rome, vol. ii. Eng. Trans., p. 522 seqq.), Thierry (History of the Norman Conquest, book i), E. Lluyd, and to some extent by Prichard (Phys. Hist. iii. ed. 3, p. 150), *cit. in loco;* and O'Brien (Preface to Irish Dictionary), referred to by Prichard. Many writers have laid much weight upon the similarity of the names *Cimbri* and *Kymry* as an argument for the conclusion that the Kymry came from the Danish peninsula. Münch, for example, *l. c.*, says, 'Der Name Cimbern oder Cimren für die ältere Hauptbevölkerung der jutischen Halbinsel bezeichnet diese *hinlänglich* als

the tribes who brought bronze into England, with the fashion of burning or burial in round as opposed to long barrows, may very probably have been of the same stock as the Cimbri whom we know from history.

This division in this nomenclature is proposed entirely independently of any consideration drawn either from philology or, to borrow a phrase from the Triads, from the 'hazy ocean' which they and similar documentary traditions make up. As regards philological considerations, I apprehend that it may cost some trouble to reconcile the fact that very many of the long skulls found in the

kymrisch;' and Prichard, whose other arguments do seem to me to deserve the epithet '*hinlänglich*,' adds to them, *l. c.* p. 104, 'the name of Cimbri, corresponding and nearly identical with that of the Cymru or Cumri of Britain.' This latter name he, further on, p. 168, says on the authority of Adelung, Mithridates, ii. 157, is not altogether forgotten by the present Bretons. Professor Rhys, however, informs me that 'the words "Cimbri" and "Kymry" are not related at all; if "Kymry" were translated into Cæsar's time, it would assume the form "Combroges," to be analysed like "Allobroges," and meaning probably Compatriots. The word is unknown to the Bretons, nor can it be traced on the other side of the Bristol Channel: so I am inclined to think it was only adopted by the Welsh as their national name while under English pressure. I do not mean by this to offer any opinion whatever on the question whether the people called "Cimbri" were nearly related to the ancestors of the Welsh or not.'

At the meeting of the British Association already referred to, thinking it might be of some consequence towards settling the much vexed question of the Germanic or Celtic origin of the Cimbri as known to us from the time of Marius, I gave references in parallel columns to the various more or less nearly contemporary writers who had spoken of them as Germans or Celts respectively. These references I may reproduce here.

For the Celtic origin of the Cimbri, see

Cicero, De Oratore, ii. 266.
Sallust, Jugurtha, 114.
Florus, iii. 3.
Appian, De Bell. Ill. 4.
„ Bell. Civ. i. 29.
„ „ iv. 2.
Diodorus, v. 3. 2.
„ xiv. 114.
Plutarch, Camillus, 15.
Dio Cassius, xliv. 4. 2.
Justin, xxiv. 8.
Orosius, v. 16.
Livy, Epitom. 77.

For the German origin of the Cimbri, see

Horace, Epod. xvi. 7.
Inscript. Ancyran. Tab. v. 16.
Strabo, vii. 1. 3.
Cæsar, De Bell. Gall. i. 40.
Velleius Paterculus, ii. 12.
„ ii. 19.
Tacitus, Germania, 37.
„ Hist. iv. 73.
Plutarch, Marius, 11.
„ Crassus, 9.
Pliny, iv. 28.
Mela, iii. 3.
Justin, 37. 4.
Seneca ad Helv. 6.

Most of the modern German writers on this subject, with the distinguished exception of Niebuhr (Kleinere Schriften, p. 383), claim the Cimbri as their kinsfolk. It may be sufficient to name Zeuss, D'Ukert, Grimm, Duncker (Orig. Germ. 79-92), and Dahlmann, and a monograph containing many references and other valuable matter by Dr. Pallmann, Die Cimbern und Teutonen, Berlin, 1870. Baron de Belloguet agrees with these writers; see Ethnogen. Gaul. iv. p. 87, 1873. For the Celtic origin of Cimbri we have, with Niebuhr, among English writers Prichard and Latham, among French writers Thierry, H. Martin (Sur l'Ethnogenie Gauloise, iv. p. 89, 1873), and amongst Northern writers Münch and Nilsson. The craniographer will incline to the Celtic hypothesis.

round barrows of the bronze age lying peacefully in company with brachy-cephali are indistinguishable from very many of the long skulls found in long barrows together with implements of bone and stone (see p. 527 *supra*), with the conclusion drawn from the Celtic and other words signifying metal to the effect that all the Celts were in possession of metal from the first time when they came into Europe, unless we agree to speak and think of the Stone Age as Preceltic. In other words, it is of importance to keep in mind that a division of skulls into skulls of a Silurian and skulls of a Cimbric type is, probably, not coincident with that division of the Celtic race into Gaels and Cymry which is, I suppose, the division usually adopted by historians and literary antiquarians. The race which used stone and bone implements may, so far as the naturalist's investigations teach him, have spoken either a Turanian or an Aryan tongue; what he sees in their skulls and their surroundings impresses him with the notion of an antiquity which may have given time enough and to spare for the more or less complete disappearance of more than one unwritten language. The bronze period again, though its term of duration in these islands was no doubt almost infinitely shorter than that of the stone and bone age, or rather ages, was yet long enough, as the antiquary may assure the philologist, to admit of quite as great a differentiation in any single language as that which exists between Gaelic and Cymric at present, or to allow of the importation of more than one already differentiated dialect in more than one not recorded invasion. But if the bronze age may have been of very long duration, and if the stone and bone age as represented to us in the long barrows may have been of very much longer, the antiquary who may have explored one of these latter tumuli on a hill, the sides and bottom of which may contain in their gravels the implements, if not the bones, of still earlier races, knows and feels that in dealing even with human phylogeny, he has to keep constantly in mind in all his speculations that the permutations and combinations of races possible in such lengths of time are conceivably and even practically infinite. The consideration of distance in space when we are dealing with a question of geographical distribution is inseparably connected with the consideration of length of time, and the great interval of space which separates Spain from Great Britain should make us careful as to borrowing a name from the tribes of one of those countries and imposing it upon a tribe in another without the most definite historical or archæological reasons.

Without going into the arguments which the Rev. Wentworth Webster has (see Journal Anth. Inst. London, v. p. 5, July, 1875) brought forward against the view which would identify the Basques with the earlier dark-haired dolicho-cephali of Great Britain, it may be well to state the history of the opinion which connects certain Welsh and Irish inhabitants of Wales and Ireland with the Iberian inhabitants of Spain. This, so far as I have been able to make it out, is as follows. Tacitus, in the eleventh chapter of his Agricola, says with reference to the Silures that their '*colorati vultus*,' their '*torti crines*,' and '*posita contra Hispanica, Hiberos veteres trajecisse easque sedes habitasse fidem faciunt*.' The boldness of this suggestion contrasts strongly with the caution of the opening sentence of the same chapter, '*Ceterum Britanniarum qui mortales initio coluerint indigenæ an advecti, ut inter barbaros, parum compertum*;' nevertheless, Jornandes, as quoted p. 630, and Irish and Spanish histories and traditions are constantly (see, e.g., Professor Morley, English Writers, 1867, vol. i. pt. i. p. 159) referred to as agreeing in asserting that the Irish Gael came from Spain; and it is even added, as if the process had been actually observed in the Bay of Biscay, that 'by means of their small ships, slowly and in the course of years, the Spanish Gaels colonised Ireland and our western coasts.' It seems obvious enough that what is thus put forward as a consensus of evidence means merely that a number of inferior writers repeated, as is so often the case, with particular emphasis and increase of precision one of the very few rash suggestions which a really great writer may have made[1].

[1] Prichard, Phys. Hist. iii. 108, who speaks of Tacitus as having been 'under the mistake of supposing Spain to be opposite to South Wales,' and of 'undue stress' having been laid by various writers, including Niebuhr, upon 'the idea of attributing an Iberian origin to the Silures,' seems to think that it was not his 'deliberate opinion that the Silures came from Spain.' A good deal depends upon the reading of the over-terse phraseology of the historian; I incline to think that by the words '*proximi Gallis et similes sunt*' Tacitus meant to indicate that a third division of the inhabitants of Great Britain, in opposition to the Caledonians and the Silures, was constituted by those inhabiting the south-east corner of the island, next to Gaul, of whom Julius Cæsar had spoken in a parallel passage, B. G. 5. 14. If this be the true meaning of those five words, the words which Prichard refers to as qualifying the suggestion as to the Silures, '*in universum tamen æstimanti Gallos vicinam insulam occupasse credibile est*,' would not really have any relation to them. Zeuss, Die Deutschen, p. 202, is as distinctly condemnatory of his suggestion as is Prichard: 'Mit eben so ungenügendem Gründen wie die Völker von Caledonien von Germanien werden diese Silures von Tacitus von den Iberern abgeleitet.' As regards the Irish tradition of a connection between Ireland and Spain, Professor Rhys writes to me to the effect that it is not a genuine tradition at all but only an etymological one, all turning on (H)iberus and Hibernus or Gallicia and Gael.

The duality of type presented to us by the intermingling of dolicho-cephali and brachy-cephali in the interments of the bronze period has been continued down to the present day amongst the inhabitants of Wales and some other Celtic localities in forms which, however real, are yet happily compatible with their occupying the same area both in life and after death. The present Bishop of St. David's, in his book, 'Vestiges of the Gael in Gwynedd,' 1851, pp. 72, 73, whilst accepting the usual philological and physiological arguments against the singleness of origin for the entire British population of Wales, adds certain evidence, based upon the differing moral phenomena manifested at the present day by the inhabitants of the Principality in the form of mutual repulsion and dislike, which points in the same direction. For this the reader may be referred to his book. A similar history is given by Professor Broca of the inhabitants of *le pays de Leon* and *le pays de Cornouaille* in Brittany (Memoires de la Société d'Anthropologie de Paris, tom. i. 1860, p. 21), and readers of other French writers on Ethnology are abundantly familiar with the question of *la dualité gauloise*[1].

Against calling the brachy-cephalic people of the round barrow and bronze period by the name of the Ligures, a people so much and, probably, so unjustly abused by the ancient Latin writers, arguments of the same general kind as those already brought against calling the dolicho-cephali of the stone age Iberians might be adduced at considerable length. It is however superfluous to do

[1] It may be well to supply evidence from times intermediate in date between the present and the bronze age to show that, whatever proneness the Celtic race and its subdivisions may, as testified to by the two authors just cited, manifest to quarrels and disagreements of a minor kind, they have in practice found it more possible to make such differences compatible with joint occupation of the same country than have some other races. Diodorus Siculus, v. 33, *cit.* Zeuss, p. 163, writes thus of the formation of the Celtiberian nation: *Οὗτοι γὰρ τὸ παλαιὸν περὶ τῆς χώρας ἀλλήλοις διαπολεμήσαντες, οἵ τε Ἴβηρες καὶ οἱ Κελτοί, καὶ μετὰ ταῦτα διαλυθέντες καὶ τὴν χώραν κοινῇ κατοικήσαντες, ἔτι δὲ ἐπιγαμίας πρὸς ἀλλήλους συνθέμενοι, διὰ τὴν ἐπιμιξιάν ταύτης ἔτυχον τῆς προσηγορίας. Δυοῖν δ' ἐθνῶν ἀλκίμων μιχθέντων, κ. τ. λ.*

The words of Skylax, *cit.* Zeuss, p. 167, respecting the Ligurians and Iberians are similarly to the purpose: *Ἀπὸ δὲ Ἰβήρων ἔχονται Λίγυες καὶ Ἴβηρες μιγάδες, μέχρι ποταμοῦ Ῥοδανοῦ.*

The existence, lastly, of the name Κελτολίγυες, Strabo, 4. p. 203, may seem to show that a fusion was effected between the Celts and the Ligurians similar to that which was effected between the Celts and the Iberians. The earlier relations between the Celts and the Ligures are represented in tradition to the following effect in the lines of Avienus, Ora Maritima, v. 432:—

> 'Cespitem Ligurum subit
> Cassum incolarum, namque Celtarum manu
> Crebrisque dudum prœliis vacuata sunt
> Liguresque pulsi.'

this, as the brachy-cephali for whom the name 'Ligurian' has been proposed of late by the Baron de Belloguet[1], Herr Hölder[2], M. Léon Vanderkindere[3], and Professor S. Nicollucci[4], are short of stature and dark of complexion, whereas the brachy-cephali with whom we have to deal were certainly tall, and all but equally certainly light in hair and complexion.

The skulls from the earlier British barrows have been stated to be invariably dolicho-cephalic, whilst the skulls from the barrows of the bronze period, though in some cases exclusively brachy-cephalic, may belong to either one or other of these two types. The few skulls which I have been able to examine or to read of from interments of what is called the late Celtic period, the period intervening between the close of the bronze age and the establishment of the Roman power in this country, have been dolicho-cephalic, a fact which may be explained either by a reference to the well-known persistence with which 'les types autochthones survivent à la domination étrangère et au mélange des sangs[5],' or, though with less probability, by the hypothesis of a preponderance having been given in this iron age to the still surviving dolicho-cephalic stock in the way of invasions from the continent. The dolicho-cephalic late Celt however differed probably from the dolicho-cephalic inhabitant of these islands in the stone age in being light- instead of dark-haired[6]. See pp. 658, 683 *infra*.

[1] Ethnogenie Gauloise, *cit.* Virchow, Archiv für Anthropologie, vi. p. 107, 1873.

[2] Archiv für Anthropologie, ii. p. 56, 1867. In his Zusammenstellung der in Württemberg vorkommenden Schädelformen, 1876, p. 8, Herr Hölder has given up the title 'Ligurian,' and replaced it by the titles 'Turanian' and 'Sarmatian.'

[3] Recherches sur l'Ethnologie de la Belgique, p. 58. The skulls, with a cephalic index of 85, described by Dr. Sasse from South Beveland, Archiv für Anthropologie, vi. p. 76, had a cubical content of 1323 cub. centim. = about 80 cubic inches, as against an average content of 98 cubic inches obtained by Dr. Thurnam from twenty-five British brachy-cephali. Probably this inferiority was correlated with an additional inferiority in the matter of stature.

[4] Le stirpe ligure in Italia, Napoli, 1864.

[5] Broca, Mémoires, i. 340, 341.

[6] Broca, Bull. Soc. Anth. Paris, ser. ii. tom. viii. Avril, 1873, p. 319, says that certain districts of modern Brittany, in which the British refugees from the Saxon invasion of the fifth century settled in great numbers, are still distinguished by the tallness, light complexion, and dolicho-cephaly of their inhabitants. He calls this stock 'Kymrique,' in the application of which word I differ from him. Similarly, at least as to the cephalic index, certain interments from the period of transition from bronze to iron described by Kopernicki, *cit.* Ecker, Archiv für Anthropologie, ix. p. 118, 1876, as examined by him in South-east Galicia, were found to furnish skulls 'exquisite orthognathe dolicho-cephalen' (C. I. = 73), contrasting strongly with the pronounced brachy-cephalism (C. I. = 81) of the modern Ruthenian inhabitants of that district.

It is undoubtedly an important fact that in no skull from any long barrow, that is to say, in no skull undoubtedly of the stone age, examined by us, has the breadth been found to bear so high a relation as that of 80 : 100 of the length; for this alone would suffice to show that Retzius's classification of skulls into two great divisions of dolicho-cephalic and brachy-cephalic cannot, even when taken to connote merely the strictest geometrical proportions, be summarily set aside as an artificial one. But, as Professor Cleland has well pointed out in a memoir (Philosophical Transactions, 1870, vol. 150, p. 145), the value of which is in the inverse ratio of the attention it has received, at least from foreigners; by 'dolicho-cephaly' and 'brachy-cephaly' respectively, Retzius intended that much more should be connoted than that 'ordinarily the longitudinal diameter of the dolicho-cephalous skull surpasses the breadth about one fourth, while in the brachy-cephalous the difference varies between a fifth and an eighth[1].' I propose here to enumerate the various points, mostly, though not entirely, those specified by Retzius, which characterise the two sets of dolicho-cephalic and brachy-cephalic crania with which I have here to deal, besides and beyond those which are etymologically implied by these names; and having done this I shall attempt to give some rationale of the existence of these differences.

The peculiarities of the contour of the brachy-cephalic crania already described have been repeatedly alluded to above, pp. 571–601; of these peculiarities the most important as well as the most constant is, I incline to hold, the relation held by the posterior aspect of the skull to the plane of the parietal tubera. In the brachy-cephalic skull the parietal tubera are usually situated high up on the sides of the skull, and almost invariably the profile

[1] Retzius confined himself to this binary division of skulls, and I have in the foregoing Description of Skulls followed his example in this matter. Other writers have made many subdivisions of the two primary divisions of Retzius, which may be seen given in a tabular form by Ihering, Zeitschrift für Ethnologie, bd. v. 1873, p. 12. The subdivision suggested by Ihering himself, p. 141, has claims upon the attention of those who wish for additional subdivisions constituted upon the principle of actually existing proportions. He proposes to call

Skulls with a relation of breadth to length of 80 and upwards, 'Brachy-cephalous.'
" " " 72 and below, 'Dolicho-cephalous.'
" " " 72-80, 'Meso-cephalous.'
And of 'Meso-cephalous,' those with index from 72-76, 'Meso-dolicho-cephalous.'
" " " 76-80, 'Meso-brachy-cephalous.'

A far more important subdivision has been suggested by Professor Cleland, *l. c.* p. 148, whereby each of the two primary divisions would be subdivided according as they are 'latiores' or 'angustiores,' whilst retaining the *contour* characteristic of their respective types.

line of the vertical arch as viewed in the *norma lateralis* dips into the posterior aspect of the skull at a point very little behind the plane of these tubera. The skull, in other words, and from another point of viewing it, that namely of the *norma verticalis*, rounds itself off somewhat abruptly from the level of the parietal bosses, instead of tapering as in the other type somewhat gradually towards the *squama occipitis*. This latter portion of the posterior aspect of the skull is not, as usually stated, by any means invariably flat; it is, on the other hand, very frequently markedly convex, the more markedly so, of course, on account of the flattening of the parietals to form the dip into the back aspect of the skull. As above pointed out in the description of the skull 'Cowlam' (lix. 3, p. 226), p. 589, note 2, the occipital squama may so project as to constitute what has been called a 'capsuläres Hinterhaupt' in typically brachy-cephalic crania. In casts of such skulls the parts of the brain which were lodged in the fossæ of the superior *squama occipitis* may be seen to project as well defined mamillary out-growths beyond the plane of the curve of the upper part of the posterior aspect of the cerebral lobes, and to overlap the cerebellum proportionately[1]. Now it was shown long ago by Huschke (in his Schädel, Hirn und Seele, 1854, p. 142), and has been repeatedly confirmed since by other investigators of the relations of the brain to the brain-case, that the parietal eminence covers a particular lobule in the brain beneath it, the lobule, to wit, which is called by Gratiolet in his better known[2] Mémoire sur les Plis Cérébraux, p. 60, the 'lobule of the marginal convolution;' and which is called by Huschke, *l. c.*, the 'lobulus tuberis.' Similarly Huschke (pp. 62 and 142) pointed out that a particular part of the brain was limited

[1] See p. 573, note, *supra*, and compare figure of skull from Wetton Hill Barrow, Cran. Brit. xiv. pl. 12, and pl. 16 and 27: and in 'Crania Helvetica,' E. xvi. and xvii.

[2] Huschke, owing to certain faults of style and arrangement, and also to his investigations of facts being very largely interlarded with questionable philosophy, has not obtained all the credit which his laboriousness merited. Besides allocating the *lobulus tuberis*, and the occipital lobes proper, to particular parts of the skull, he also definèd the true position of the fissure of Rolando relatively to the coronal suture, p. 139, and that of the superior frontal gyrus relatively to the frontal tubera, p. 154, in the same year in which Gratiolet, *l. c.* p. 101, wrote as follows: 'La boîte crânienne forme une vaste et libre cavité. C'est une voûte sons laquelle les plis et lobes cérébraux s'avancent, se reculent, s'étalent, se resserrent, s'écartent, se refoulent; ces mouvements, n'ayant aucune relation absolue avec les éléments dont cette voûte se compose!'

Huschke's own countrymen, to whom his writings must be easier reading than they are to readers of other nationalities, have not always rendered him full justice. Professor Meynert however forms an exception to this rule; see his paper on Die Windungen der convexen Oberflache des Vorderhirns, Archiv für Psychiatrie, bd. vii. hft. 2.

in front by a line corresponding to the upper part of the lambdoid suture, and, similarly, subsequent writers have coincided with his observations. There is of course no greater *à priori* improbability attaching to the view, that as fixed a relation should subsist between particular parts of the cerebral hemispheres and the bony capsule thrown over them as every one knows to subsist between the various factors of the dental series and the maxillary and intermaxillary bones respectively of a marsupial or a placental mammal. The fact however, when demonstrated, gives a fresh interest to cranioscopy, and I shall revert to it further on, p. 666 *et seqq. infra.*

The conceptacula cerebelli in the brachy-cephalic type are said by some authorities[1] to take a more vertical direction than they have in the dolicho-cephalic; and they are also supposed to be more[2] globose externally in female than in male skulls. An examination of the strong male skulls of the bronze period bears out neither of these views. It is true that such skulls may have the lower part of the occipital bone flat and semivertical, but they often have the convexity downwards of the inferior squama occipitis as marked as we sometimes see it to be in skulls of feebler texture in which it might be considered to be a 'déformation plastique[3],' and to be due to downward pressure of the superincumbent brain. And this convexity of the conceptacula cerebelli, when viewed in the light which Professor Cleland (*l. c.* pp. 136, 162) has thrown upon the extent to which 'gravitation changes' can remodel the cranium after adult life has been reached, may very reasonably be considered to be due, in some measure at least, even in this robust type, to the operation of the same downward pressure. Be this as it may, the convexity of the inferior occipital squama of the British brachy-cephali, a peculiarity which would not have been visible to the eye during life, is, if not correlated with, at any rate accompanied very often (see p. 601 *supra*) by another peculiarity, which must have been eminently striking in their living heads, to wit, their great relative height, which has been called 'hypselo-cephaly,' or 'acro-cephaly,' and must have put them into sharp

[1] Cleland, Phil. Trans. 1870, p. 147. Thurnam, Principal Forms, p. 37.

[2] Welcker, citing J. B. Davis, A. A. i. 126, 1866, *per contra* Huschke, *l. c.* p. 21, says:—'Die *fossæ cerebelli* der Hinterhauptsschuppe beim Manne weit ausgegrabener sind und daher aüsserlich mehr hervorragen als die weiblichen welche, wie im Kinde mehr horizontal liegen.'

[3] The true 'deformation plastique' of Dr. B. Davis I have never seen in these series.

contrast with the 'tapeino-cephalic[1]' or 'low-lying' heads of at least the female descendants of the long-barrow people who were still living amongst them. It puts these skulls into a similar position of contrast when compared with most of those of the dark-haired brachy-cephalic stocks now existing in Europe; and, taken together with their much larger cubical capacity, with the greater stature, and with the different complexion of their owners, it shows us that we have to deal, if not with two exceedingly different races of men, at least with two exceedingly different sets of individual men[2]. But we must never lose sight of the fact that in dealing with a series of skulls from these prehistoric barrows we are all but certainly dealing with the skulls of a set of individuals from the upper classes of times when members of those classes were, as are the chiefs of many modern savage races, from the operation of one or both of two causes, larger and more powerful, and *pro tanto*[3] larger-brained men than were the mass of the population.

[1] For the use of this word see Professor Busk, Journ. Ethn. Soc. Lond. vol. ii. pp. 467, 468, where it is suggested that tapeino-cephaly may indicate lowness of type among ancient as it does among the modern Bushmen and Tasmanian races.

[2] The average cubical capacity of the ancient British brachy-cephali, as given by Dr. Thurnam, is 98 cub. in., as against 94 cub. in. for modern English skulls; as against 80 cub. in. (=1323 cub. cent.) obtained by Dr. A. Sasse for a series of probably comparatively recent brachy-cephalic skulls, with an index of ·85, from South Beveland, Archiv für Anth. vi. p. 76, 1873; as against an average of about 90 cub. in. (=1480 cub. cent.) for the modern Parisian skull, with an index of about ·79; as against an average of 83 cub. in. (=1377 cub. cent.) for the Disentis type of His and Rütimeyer, with an index of ·86, which includes most of the modern inhabitants of Switzerland, together with some skulls of Roman, if not of earlier times; as against an average of 89 cub. in. (=1478) for the modern Roumanians, with an index of ·82; as against an average of 92 cub. in. (=1521 cub. cent.) for the modern German (Weisbach); and as against an average of 80 cub. in. for modern Red Indians. Herr Hölder, in his earlier paper, Arch. für Anth. ii. p. 55, 1867, gave for his 'Ligurian' type, with a cephalic index of from ·84 to ·90, a cubic capacity varying from 79 cub. in. (=1300 cub. cent.) to 97 cub. in. (=1600 cub. cent.). In his monograph published last year the two types 'Turanian' and 'Sarmatian,' into which the single form 'Ligurian' is divided, are both said to have their height less than their breadth.

[3] One of these causes was no doubt their possession of a greater command of the material comforts of life; the other was the necessity which a wild tribe under a severe struggle for existence had for putting itself under the guidance of the ablest men it could find. A statement as to the operation of the first of these *veræ caussæ* is given us by Bastian, Ethnologische Forschungen, i. 335, on the authority of Logan as to Scotland, to the following effect: 'The common Highlanders from hard and often scanty fare are usually inferior in stature to the chiefs and better sort.' A statement as to the operation of the second as to Africa is given us by Mr. F. Galton in his 'Hereditary Genius,' p. 339, 1869, in the following words: 'A native chief has as good an education in the art of ruling men as can be desired; he is continually exercised in personal government, and usually maintains his place by the ascendancy of his character shown every day over his subjects and rivals.' Professor Daniel Wilson says (Canadian Journal, March, 1863, p. 151): 'I assume the unimpaired

In dealing with a series of modern skulls we are not so dealing with the skulls of the upper classes only; but ordinarily just the reverse.

This source of fallacy however does not vitiate the comparison to be instituted between the tenants of the long barrows and the more recent but still prehistoric tenants of the round ones. Indeed, as regards the point of social superiority, the larger cubical bulk of many of the long barrows relatively to the number of skeletons contained in them would seem to indicate that the owners of these skeletons had been during life, and indeed after it, in a position to command more of the labour of their fellow-men than the men of the bronze period. And there is no doubt that some of the earlier, or indeed as the Les Eyzies skull, with a cubic capacity of 100″, reminds us, earliest skulls can compare favourably with the very largest of the bronze or indeed of any other age. Dr. Thurnam's measurements gave him an average of 98 cub. in. for the British brachy-cephali as against 99 cub. in. for the older race; and the largest prehistoric skull which I have been able to cube was a woman's from the stone age excavations at Cissbury; see Journal of Anthrop. Institute, vol. vi. p. 35, 1876. Nevertheless, with my unhappy knowledge of the very large number of skulls from all prehistoric tumuli which are not recovered in a condition admitting of cubage, and for other reasons to be gathered from what has been said above, I feel that the result of the application of the method of averages to the question of the relative cranial capacity of the two prehistoric races under comparison is eminently unsatisfactory, as being eminently amenable to the question, *Ubi sunt illi qui perierint?* And I must express it as my distinct conviction, that if we could have before us a more fairly representative series of each of the two varieties of prehistoric crania in question than their social habits and the wear and waste of many centuries of lying in stony graves have left us, we should find that the bronze brachy-cephali had been not only the taller and stronger bodied, but also the larger skulled[1]

intellect of the Nasqually chief from his rank.' For further evidence as to one or other of these lines of action see the Göttingen Report of Zusammenkunft einiger Anthropologen in 1861, at p. 21; in the British Association Report for 1875, p. 150; Förster's Observations, pp. 229, 410; Ellis, Polynesian Researches, i. 82, ii. 26; Tour through Hawaii, p. 7; Erskine's West Pacific, pp. 155, 240; Brenchley, Cruise of the Curacoa, 1873, p. 137; Whitmee, Contemporary Review, Feb. 1873, p. 392; Journal Anthr. Institute, vol. v. p. 127, Oct. 1875; Moseley, H. N., *ibid.* p. 36, May 1877.

[1] For the purposes of a comparison made upon such a basis it would be safe to take the largeness of the skull as furnishing a measure of the largeness of the brain it

and larger brained race of the two. The well-filled character of the typical brachy-cephalic skull is nowhere and no way better shown in a single view of it than in the *norma occipitalis*, where in spite of the well-developed *tubera parietalia* it is rare for any very marked convergence of the lateral walls of the pentagon to be observable.

The forehead of a brachy-cephalous skull is sometimes vertical, sometimes, and especially in cases where the whole skull and skeleton are marked by great strength or even ruggedness, it is markedly sloping. It has been well remarked by Professor Cleland, *l. c.* pp. 163 and 138, that it is 'a grave mistake to predicate deficient development of the anterior lobes of the brain from a retreating forehead or great development from a vertical forehead without reference to the rest of the form of the head.' And in a preceding page (p. 160) he has pointed out that to secure the balancing of the head on the vertebral column, when the anterior lobes of the brain and the bones of the face increase in weight, without any unnecessary or constant call upon muscular force, a certain amount of 'tilting or rotation backwards' is mechanically necessary, and is physiologically effected. Another explanation has been given[1] of the sloping of the forehead by supposing it to be caused by increase in length of the basicranial axis, and a consequent throwing forward of the lower half of the frontal bone; and, as Professor Cleland has himself pointed out, *l. c.* p. 124, a long base line is eminently characteristic of the skulls of uncivilised nations. But though the operation of this cause may account for the retreat of the forehead in the heads of some dolicho-cephalic races, as also for the readily observable fact that in male skulls even of civilised races a sloping forehead is much more common than in female skulls, in which (see Cleland, p. 125, *l. c.*) the growth of the base line ceases much earlier, I do

contained. The thickness of the skull-walls to be estimated by weighing the skull or, by preference here, the calvaria, would probably not differ very much, and, if at all, to the disadvantage, I incline to think, of the brachy-cephalic type. Allowance would of course have to be made for any difference set up either by the removal of organic matter or by the infiltration and deposit of inorganic salts of iron or of lime. It may be true, as Professor Bischoff has shown, *l. c.* pp. 36, 45, that extraordinary individual variations in the brain-weight may be noted in brains from skulls with the same circumference, and that no fixed relation can be affirmed to exist between the variations of brain-weight and those of cubical contents as measured by other than brain-substance; but this want of concomitance would be as likely to occur in the one as in the other set of subjects of comparison.

[1] Welcker, Wachsthum und Bau, p. 76.

not think that it accounts for the obliquity so often observable among the British brachy-cephali. In them I incline to consider it as the result of counterpoise to their heavy lower jaws[1]. Many of the bronze period skulls with sloping foreheads are yet skulls

[1] It is interesting to reproduce here some remarks on this subject made nearly forty years ago by a French writer, M. Lafargue, in a journal the early volumes of which I have had some difficulty in getting access to, and procured ultimately from the library of the Royal College of Physicians. They run as follows (Archives Générales de Médécine, iii. 2, 1838, p. 135): 'Etant données des mâchoires volumineuses et saillantes la totalité du crâne se porte specialement en arrière en se distribuant avec uniformité autour de l'axe s'il est allongé comme chez le nègre, en se concentrant à l'extremité postérieure de cet axe s'il est raccourci comme chez le Calmouk et le Malais.'

P. 137. 'Les crânes des différentes races humaines trouvent comme on voit la raison de leurs formes dans les proportions respectives de la face et du cerveau et dans certaines conditions d'équilibre qui varient avec ces proportions.'

The following remarks deserve attention for their bearing upon some wider questions, as well as upon the particular one referred to in the two preceding ones.

P. 141. 'Il resulte de ce qui procède que la forme du crâne des différentes variétés humaines a deux significations réelles: l'une se rapporte à certaines conditions d'équilibre, variables suivant la proportion de la face au cerveau; l'autre exprime le degré de perfection intellectuelle et morale, en indiquant le volume de ce dernier organe. Mais la cérébroscopie comparée ne justifie pas les trois grandes localisations phrénologiques.

'Si l'on compare entre eux les sujets de la même race, on trouve un grand nombre de faits exceptionnels qu'il est nécessaire d'apprécier, avant d'examiner le système de Gall dans son application aux individus de la race blanche.

'L'intelligence et le moral sont d'autant plus complets que le cerveau l'emporte davantage sur la face: telle est la loi qui resulte de la comparaison des espèces animales aux races humaines, la *loi* dont Camper, Daubentin et Cuvier ont reconnu la réalité. Quelques hommes plus logiciens qu'observateurs pensent que le volume *absolu* de l'encéphale détermine seul la puissance intellectuelle; que deux individus dont les hémisphères sont égaux doivent manifester la même capacité, bien que l'un d'eux l'importe sur l'autre par le volume des mâchoires: car, ajoutent ils, ce volume n'a aucun rapport avec les fonctions de l'encéphale. Les raisonnements *a priori* se brisent contre les faits, et le rapport direct des facultés avec la masse, non pas *absolue*, mais *relative* des hémisphères est un *fait* d'histoire naturelle, un fait assez constant pour établir une loi.

'Cette loi, franchement exprimée par les caractères généraux de chaque type, ressort encore de la comparaison des individus de la même race; ainsi, dans la variété blanche, il est bien reconnu que les hommes supérieurs ont le plus souvent un crâne bien développé et des mâchoires peu saillantes; qu'au contraire, le plus grand nombre des hommes *simples*, *obtus* ou *idiots* se distinguent par l'étroitesse de la cavité cérébrale, et par la proéminence de la face, signe proverbial de stupidité.

'L'angle facial, expression de cette proéminence, a de tous le temps fixé l'attention des sculpteurs et des physionomistes. Telle est la règle: voyons les exceptions. Si beaucoup d'hommes éminents, comme Gall, Cuvier, Bacon, se distinguent par un cerveau très développé, un large front, une face petite et verticale, quelques autres, comme Mirabeau, Buffon, ont le crâne étroit, le front fuyant, et les mâchoires très prononcées. Au contraire, on voit assez souvent des individus remarquables par le développement du crâne, par les proportions harmoniques et la beauté de la face, manifester néanmoins une déplorable incapacité. Leurs traits immobiles ou niaisement expressifs, leurs yeux mornes ou pétillants d'une joviale nullité, concourent à démentir la noblesse du front. Peut-on attribuer l'infériorité de ces hommes au vice de l'éducation, si celle-ci a été la même pour eux que pour les autres?'

of large capacity, and we have no reason for doubting that their owners may have been, as men with such foreheads often are now, persons at once of considerable intellectual and of considerable physical power. It is not easy to understand why in some cases we should find brachy-cephalic skulls with fairly powerful lower jaws maintaining nevertheless the same or nearly the same verticality of forehead which characterised them in childhood and early boyhood. It is obvious however that in cases such as these[1], the length of the base line of the skull remaining as it does practically the same, or differing by merely the tenth of an inch or so, and the length of the frontal, parietal, and occipital arcs, which make up the cranial vault resting on this base line, remaining also practically constant, the position of the true vertical line of the cranium must, as already mentioned (p. 559 note), change its position relatively to the coronal suture. And with this change there must have followed during life a somewhat different mode of carriage of the head relatively to the horizon, a difference observable enough in living heads at the present day.

As regards the characteristics of the facial skeleton, I find my observations upon the brachy-cephali of the East Riding of Yorkshire in entire accordance with those given picturesquely as well as scientifically of the facial characters of the brachy-cephali of the South-west of England by Dr. Thurnam in his papers in the Memoirs of the London Anthropological Society, vols. i and iii, 1865–1869. Distinctive as must have been the characteristics already pointed out of the living calvaria and its hairy scalp, the characteristics of the living face, from the supraciliary ridges to the chin and transversely from one cheek bone to the other, must have put the men of the round barrow time into even sharper contrast with the surviving descendants of the men of the stone and bone ages. The eyebrows in the powerful men of the later period, if developed at all in correspondence with the large underlying frontal sinuses and supra-orbital ridges, must have given a beetling and probably even forbidding appearance to the upper part of the face, whilst the boldly outstanding and heavy cheek bones must have produced an impression of raw and rough strength and ponderosity entirely in keeping with it. Overhung at its root, the nose must have

[1] See Aeby, Schädelformen, p. 127.

projected boldly forwards, not merely beyond the plane of the forehead, but much beyond that of the prominent eyebrows themselves. In some cases, but not by any means in so many as might *à priori* have been expected, the somewhat lengthy upper jaw had its anterior or incisive segment projecting so as to constitute alveolar prognathism, whilst the sockets of the canines and those teeth themselves attained such a development as to give a somewhat square appearance to the jaw when viewed from in front. The lower jaw, which in every well-marked variety of the human species contributes very importantly towards the making up of its distinctive character, was in the brachy-cephalous Briton usually a very different bone from the lower jaw of his Silurian predecessor. Its chin was prominent, and contributed a greater proportion to the entire depth of the bone in front than the alveolar portion. Its ramus might not be thicker and stouter than the ramus of the other variety with which it is compared, but as the eye follows the lower line of two such lower jaws along to their angle the superior strength of the later type is made manifest, not merely by the muscular markings and eversion of the angle, but by the much greater width of the entire bone at this point.

We may now pass from the brachy-cephalic British skull of the bronze period, leaving some of its minor characteristics to be gathered in the way of contrast from the ensuing general description of the dolicho-cephalic variety, and summing up the general impression which an inspection of a series of such skulls makes upon an observer by saying that it suggests the application of such epithets as 'well-filled,' 'eurycephalic,' 'sub-cubical;' or when the rounding-off effect of senile change has begun to tell, 'sub-spheroidal;' and finally of 'massive and powerful' in an eminently emphatic manner.

When a considerable number of skulls from any one barrow of the stone and bone period, such as those spoken of at pp. 539–541 *supra*, are arranged in a single line upon a long table along another line of the surface of which a corresponding number of the brachy-cephalic crania of the bronze period, and along a third a corresponding number of Anglo-Saxon crania are similarly arranged, the following remarks suggest themselves to the craniographer. It might be said, firstly, that the two sets of pre-Saxon skulls were well nigh as distinct and as sharply contrasted as any other sets of skulls which it is possible to put alongside of each other from

either ancient or modern times; that the Tasmanian skull could scarcely be said to differ more from the modern European, nor the Eskimo from the Andamanese, than some of the typically elongated and wall-sided long barrow skulls differ from the broad and sub-spheroidal skulls of the bronze period. And (whatever may have been averred to the contrary) it might be said, secondly, that though the Saxon series agreed with the long-barrow series in being dolicho-cephalic, and though in a few instances skulls from these two series were very closely like each other, there was nevertheless no great difficulty in distinguishing between these two series also, and even that in the individual cases of similarity it was very rare not to be able to point, when all the peculiarities of each skull were taken into account, some one or more than one important point of difference either in the calvariæ, or in the facial bones, or in the lower jaws of the older and of the more recent skull [1].

A third remark of equal generality and importance would be suggested by this survey of these three sets of crania, to the effect that though skulls very closely similar to the typical representatives of either of the pre-historic series might be found upon living shoulders amongst the present population of this country, the elongated and fairly well-filled oval Anglo-Saxon cranium was the prevalent form amongst us in England [2] at the present day.

[1] Many authorities may be cited for the proposition that the typical dolicho-cephalic Scandinavian is not to be distinguished from the typical dolicho-cephalic Celtic skull. Amongst these may be named Retzius and Sir William Wilde in Retzius' Ethnologische Schriften, p. 8, *cit.* Huxley in Prehistoric Remains of Caithness, p. 129; Nilsson, Ancient Inhabitants of Scandinavia, ed. Lubbock, p. 117, and British Assoc. Report, 1847, p. 32; Omalius d'Halloy, *cit.* Virchow, Archiv für Anthrop. vi. 1873, p. 114; Virchow himself, Berlin Abhandlungen, 1876, p. 3; Ecker, Archiv für Anthrop. iii. 155; Schaafhausen, Die Urform des Menschlichen Schädels, p. 5. Against all these weighty authorities I have to set the fact that if I place a skull of one or other of these two races before the skilful and very extensively experienced articulator and restorer of prehistoric crania, Mr. W. Hine of the University Museum, without giving him any hint of the archæological surroundings in which it was found, he will ordinarily be right in his reference of the skull to one or other of these races. The points of difference which thus guide to a right conclusion will appear in the description to be given in the text.

[2] In Germany anthropologists are not as yet at one as to whether the dolicho-cephalic form of skull, which when combined with tall stature and light hair and complexion has been usually considered to constitute 'Das Germanische Typus,' is at the present day both outnumbered and qualitatively excelled by the brachy-cephalic type or not. Ecker, in the Archiv für Anthrop. ix. 4, p. 259, 1877, expresses himself thus: 'Wissen wir doch z. B. dass die in unserem Lande einst so verbreitete Schädelform der Reihen-Gräber die wohl unzweifelhaft auch mit einer bestimmten Körperstatur verbunden war, jetzt fast ganz einer anderen Form Platz gemacht hat, deren Träger

A fourth general observation would arise out of such an inspection of these three series of crania to the effect that, though in each

in ihrem ganz physischen Habitus anders geartet sind, als jene es wahrscheinlich waren. Waren jene hochgewachsen vorherrschend blond, so sind diese gedrungener, dunkler von Haar und Augen.' Virchow, who has repeatedly expressed himself to the effect that brachy-cephaly is a higher form of skull than dolicho-cephaly (see Arch. für Anth. v. 4, 1872, p. 536, where Calori is quoted to the same effect as regards the Italians; or, Zeitschrift für Ethnologie, iv. 2, p. 36, where Cortese is similarly cited as to the smaller size and stature of modern Italian dolicho-cephali; or, Sammlung, ix. 193, 1874, p. 45), would appear, from his saying, Arch. für Anth., *l. c.* p. 540, that the broadening which the dolicho-cephalic modern German skulls of which Herr Hölder writes have attained to as compared with the ancient dolicho-cephali may bring them within the limits of brachy-cephaly by measurement, to neglect the difference which Professor Cleland (Phil. Trans. *l. c.* p. 146) has so well insisted upon as existing between dolicho-cephaly of type and contour as opposed to that constituted by mere measurement of the single relation of breadth to the length, and that too irrespectively of the height. Herr Hölder appears to have proved that the Germanic type as ordinarily understood has the larger and better developed brain, at all events in the parts of Germany known to him (see his Memoirs, Archiv für Anthropologie, ii. pp. 53-55, and Zusammenstellung der in Württemberg vorkommenden Schädelformen, 1876, and the discussion at the meeting of the German Association for Anthropology held in Stuttgart in August 1872, reported in the Arch. für Anth. v, p. 539). His words in the Report just quoted are, 'In Würtemberg finden sich aber unter den seit Generationen geistig beschäftigten Ständen viel mehr dolichocephale Formen als unter den Handarbeitern.' The facts, so far as I can collect them as regards Germany, appear to me to be that the genuine Teutonic type, as we know it from undoubtedly Anglo-Saxon, and from Frankish skulls, has, in the course of centuries (some of which have been times of culture, and all of which may have been times admittedly of crossing with a brachy-cephalic stock), intermediate in archæological date between the Reihen-Gräber period and the earliest graves, become relatively somewhat broader, but without losing its primitive contour. Throughout Germany however there exists a brachy-cephalic stock, usually but by no means always, darker haired and of shorter stature and of less cranial capacity than the typically dolicho-cephalic variety; and this stock, whatever its other disadvantages, has at all events a numerical preponderance in South Germany (see Huschke, *l. c.* p. 98; Virchow, Beiträge, 1876, p. 6; Huxley, in Prehistoric Remains of Caithness, p. 108). Persons who will verify the references I have given will find that a good deal of other than purely scientific interest has come to attach itself to this discussion. Professor Broca's views as to the superiority of the brachy-cephalic type appear to coincide with Professor Virchow's. They may be found in his 'Memoires,' vol. i, 1871, p. 342, and Bull. Soc. Anth. de Paris, Tom. vii. Ser. iii. Fasc. v. Dec. 5, 1872. Dr. Hölder's last summing up of the question, Zusammenstellung, pp. 34, 35, runs thus:—

'Die Bewohner des heutigen Europa sind ein buntes Gemisch der oben angeführten 4 Rassen zu 2, 3 oder 4, und nur von dem Vorherrschen der einen oder anderen dieser Elemente hängen die Eigenthümlichkeiten der verschiedenen Nationen ab. Nur in einem theile von England, Schweden und Deutschland herrscht der germanische Typus vor, ganz unvermischt ist aber wohl nirgends mehr. In dem grösseren Theile des letzteren stehen die germanischen Elemente den brachycephalen in ziemlich gleicher Zahl gegenüber, oder sind sogar in entschiedener Minderheit. . . .

'Mit der unverwüstlichen Zähigkeit welche ihm eigen ist, kommt er selbst in den am meisten brachycephalen Bezirken Deutschlands immer wieder auf die Oberfläche, wie die von mir zusammen gestellten Mischformenreihen zeigen. Welches das End resultat sein wird, kann niemand wissen, nur so viel ist sicher, dass alle Mischrassen so lange in Fluss bleiben, bis sie zu Grunde gegangen sind oder bis das schwächere Element von dem kräftigeren umgewandelt ist; aber nur bis zu einem gewissen Grade,

of them a certain number of what Professor Cleland has expressively called 'ill-filled skulls' were to be pointed out, the larger proportion was to be found in the earlier of the two series. To this subject we shall revert further on, and we may now proceed to make some more detailed remarks upon the particular characteristics of the long-barrow-period skulls.

Viewed in the *norma lateralis*, skulls of this kind most usually present us (see figure of 'Langton Wold, ii. 1,' p. 602) with a contour line describing a more or less even oval curve from the upper boundary of the supraciliary ridge to the centre of the prominent occipital squama. A few instances however will be found in which the upper contour line, instead of describing the curve, will, after sinking into a broad undulation posteriorly to the coronal suture, rise to its highest point in the middle third of the parietal arc before passing on to the back aspect of the skull. They thus reproduce on a small scale the peculiarities of the annularly constricted variety of artificially deformed skulls (see p. 595 *supra*), and, like these skulls, will be usually found to belong to individuals of slight build and feeble physique. They resemble even more closely in this point and some others the 'hypsistenocephali' of Dr. Barnard Davis. The one eminently distinctive and characteristic point of these dolicho-cephalic skulls is the forward position of the parietal tuberosities, and of the ear, with which is correlated even in female skulls (as for example 'Sherburn Wold, vii. 1,' p. 610) an oblique slope as opposed to a precipitous vertical dip in the parieto-occipital region. The temporal lines and the half of the lambdoid suture are seen laterally in nearly or quite their entire length. The forehead may be, and indeed often is, low as viewed in the *norma lateralis* and narrow as viewed in the *norma verticalis*, and may very well merit the description *frons valde depressa* which Sir R. C. Hoare bestowed (Archælogia, xix. p. 46) on some long-barrow skulls dug up by him; but it rarely manifests that pronounced obliquity, 'le front fuyant,' so common in brachycephalic skulls, and shown so plainly in the figure of the skull 'Rudstone, lxiii. 9,' p. 590 *supra*. In many, and especially in the weaker, dolicho-cephalic skulls the more strictly calvarial portion of the frontal bone rises from a plane considerably posterior to that of the supraciliary ridges, a peculiarity which, when the frontal rises nearly vertically to the level of its *tubera*, and when, as is very

denn auch das stärkere erleidet Veränderungen, welche nur unter ganz ausnahmsweisen Bedingungen wieder verschwinden könnten.'

often the case in this variety of cranium, the supraciliary ridges are confluent across the middle line, gives a very characteristic appearance to these skulls. Just as the line of the *os frontis* in these cases lies some way within the line which the contour of the supraciliary ridges would describe if produced, so the line of the posterior half of the parietals lies often well within the line which the produced contour of the upper occipital squama would give us. This peculiarity is 'die facettirte Absetzung des Hinterhaupts' spoken of as eminently characteristic of the Hohberg type of skull by Professors His and Rütimeyer. It is however, though common, not by any means constant in otherwise typical dolicho-cephalic skulls of the stone age, as might have been expected, the occipital segments proper, both of brain and of skull, being exceedingly variable[1] in development; and the 'capsuläres Hinterhaupt,' as pointed out above, p. 589, or as seen in such a skull as the one figured xiv. Pl. xii. Cran. Brit. from Wetton Hill Barrow, being by no means rare in brachy-cephalic series.

Whatever differences may exist amongst craniographers as to the existence of sexual differences in the matter of the 'length-breadth index,' there is no room for questioning the fact that the height in women's skulls[2], very variable though this measurement is in

[1] Aeby, Schädelformen, p. 12; Welcker, Wachsthum und Bau. pp. 36, 46, 65, 141; Huschke, *l. c.* pp. 19, 21, 94, 96, 98, 152, 153, 156; B. Davis, Thesaurus Cran. p. 351; Gall. Syst. Nerv. iii. 160; Virchow, Gesamm. Abhandl. p. 916; Cleland, Phil. Trans. 1870, p. 132; Wundt, Physiolog. Psychologie, 1873, p. 229, citing H. Wagner; Weisbach, Arch. für Anthrop. iii. 74, 75, 81; Broca, Rev. Anthr. ii. 1, 1873, pp. 30–32. Very conflicting statements have been put forward as to the relative development in males and females of the posterior part of the cerebrum. I incline to hold that in most dolicho-cephalic races what Huschke calls the *Zwischen-Scheitel-Hirn quæ in fossis cerebri ossis occipitis liegt'* is absolutely sub-equal to and therefore relatively greater than the homologous segment in males. As against this may be set the greater relative length of the *basis cranii* in males of our own as of other species. This is a difference however which amounts at most to about two millimeters, an excess insufficient to counterbalance that frequently observable in the female interparietal region. On the other hand, in typically brachy-cephalic races this absolutely and relatively shorter *basis cranii* and the absolute equality of the male and female intertuberal diameters in the parietal region do not rarely give female skulls a higher length-breadth index than male skulls of the same race possess.

[2] This point is well put forward by Weisbach, Archiv für Anth. iii. 1. 66, 1868, in his account of the German female skull, which in this particular admits of wider application: 'Die Höhe unserer Weiberschädel von der Mitte des vorderen Randes des Grossen Hinterhauptloches zum Scheitel welche im Mittel nur 125 Mm. in den einzelnen Fällen 118 bis 139 Mm. beträgt ist wie alle bisherigen Maasse weniger veränderlich (16·8 Proc.), als beim Manne (21·8 Proc.), jedoch unter den drei Hauptdimensionen den Meisten Schwankungen zugänglich, die Breite den geringsten; während am männlichen Schädel die Länge die geringsten, Breite und Höhe fast die gleichen individuellen Schwankungen erleiden. Das Minimum der Höhe haben

women's skulls, holds usually a less favourable relation to the length and breadth than it does in males. The only three instances in which I have in this series of dolicho-cephalic skulls found the latitudinal to be less than the altitudinal index, or, in Professor Cleland's (*l. c.* p. 148) and Professor Busk's (Journ. Ethn. Soc. 1871, p. 467) language, found the skull to be 'tapeino-cephalic,' were skulls of women. One of these was the woman (see Journ. Anth. Inst. vi. p. 36) found in one of the flint mines under the line of the fosse round the British fort at Cissbury, which were shown by Colonel Lane Fox (Journ. Anth. Inst. vol. v) to be of earlier date than that fort, itself of the stone age. The second of these was a woman's skull from the famous Rodmarton barrow, from the collection of the late Rev. Canon Lysons (see Proc. Soc. Antiq. 1863; Thurnam, Crania Britannica, Pl. 59); and the third of these was the skull of the single undisturbed skeleton found in the long barrow 'Upper Swell, ccxxxi,' described by me at p. 529 *supra*. It is true that in many of the long-barrow skulls the loss of the anterior portion of the occipital bone renders it impossible to take the 'absolute' as opposed to the 'upright' height[1], except approximatively; still I am well assured that the great majority of the long-barrow crania resemble in the favourable relation of their height to their length rather the South Sea Melanesian 'hypsi-stenocephali' of Dr. Barnard Davis ('Natuurkundige Verhandelingen,' Haarlem 1866, and Thesaurus Craniorum, p. 309) than the low-lying Tasmanian and Bushman skulls described by Professor Busk (Journal Ethn. Soc. Lond. Jan. 1871, p. 476). The *conceptacula cerebelli* lie horizontally in male and female skulls of the stone age both alike, differing herein markedly from the other type in which they are usually either globular and convex downwards or slope more or less obliquely upwards. In the *norma occipitalis* we often find given us the most characteristic peculiarities of the stone-period

beide Geschlechter gemeinsam, wogegen die Maximalhöhe des Weiberschädels sich nur wenig über das Mittel des Männerschädels (133 Mm.) erbebt, dessen Maximum (147 Mm.) jenes des weiblichen Geschlechtes weit übertrifft. Die Höhe des Weiber schädels hat im Vergleiche zu der des männlichen noch das eigenthümliche vor den anderen Hauptdurchmessern voraus, dass sie von der selben sich viel weiter (♂ 1000, ♀ 939) entfernt, daher auch der Weiberschädel im Verhältnisse zu seiner Länge (1000 : 729) viel niedriger als der männliche (738) ist.' Dr. Thurnam (Further Researches, p. 25) found as many as 8 out of 48 male skulls, and as many as 7 out of 19 female skulls, of the long-barrow period to be 'tapeino-cephalic.' For 'the latest accession of height in the male skull being wanting in the female' see Cleland, *l. c.* 148, 164; for the reverse from the Caverne de l'Homme Mort, see Rev. d'Anthr. ii. p. 29.

[1] See p. 562 *supra*.

skull, and especially of the male skull. The sides of the pentagon described by the skull's contour are in such skulls (see 'Langton Wold, ii. 1,' pp. 136, 602) either quite vertical or even converge a little from the level of the *tubera parietalia* downwards, whilst they slope upwards with well-marked obliquity to a mesial vertical carina along the sagittal line. The *tubera parietalia* in 'ill-filled' male skulls are relatively more prominent than in the better developed, in which their site may be only very faintly marked; they are usually more distinct, whilst the mesial vertical carina is less distinct, its position indeed being only feebly indicated, in female skulls (see 'Sherburn Wold, vii. 1,' pp. 146, 608 *supra*). It is in the *norma occipitalis* as well as in the *norma verticalis* that the premature obliteration of the sutures to which Dr. Thurnam drew attention in the Natural History Review of 1865 (see also Virchow, Archiv für Anthrop. v. p. 535, 1872) as being very frequent in this type of cranium is specially obvious; and not rarely, though by no means universally, in the skulls of individuals in quite early stages of adult life (see pp. 614, 615 *supra*). It is rare in the brachy-cephalic series to see any traces of such anchylosis until many other senile changes have set in with advancing years.

In many of the stone age dolicho-cephali, by combining the view given in the *norma verticalis* with that given in the *norma occipitalis*, we realise to ourselves very vividly the force of the epithets 'scapho-cephalic' and 'kumbe-cephalic' (see p. 615 *supra*) which have been applied to them. The keeled mesial ridge and the lateral wall-sidedness given in the back view are often combined with a rapid tapering, both forwards and backwards, from the plane of the anteriofly situated parietal tubera, which suggests the comparison to a long and narrow boat which the epithets just quoted embody. On the other hand, it must be said that the contour presented by these skulls in the *norma verticalis* does, whilst always retaining the length in a relation of advantage to the breadth, yet vary considerably, as the other epithets 'birnformig,' pear-shaped, 'keulenformig,' club-shaped (='elongate oval'), and coffin-shaped (='cuneate oval') by various writers applied to them plainly indicate. In other words, these skulls when viewed in this as also in other aspects are seen, whilst remaining always dolichocephalous, to vary considerably as to being well or ill-filled, globular or pinched, phænozygous or aphænozygous, rounded off or angular in the plane of greatest breadth, and finally to some extent even as to the relative position of this plane in the long axis of the skull.

As has been however already said, the conformation of the lower jaw in every well-marked variety of the human species is an eminently distinctive element in the complex aggregate of peculiarities which make up its cranial character. The presence of prognathism in the upper jaw is by no means a point of such consequence for distinguishing crania of prehistoric series *inter se*, as it is for distinguishing them from those of later and of modern races. For, as a matter of fact, prognathism, which is not always constant in its presence even in modern races reputedly prognathic, is by no means common in crania from the early interments of Britain and France, nor, according to His and Rütimeyer[1], from those of Switzerland; nor, according to Virchow (Archiv für Anth. vi. pp. 92, 93), from those of Belgium. The dolicho-cephalic skulls with which we are now dealing contrast in no point more markedly with the Anglo-Saxon skulls to which so many authors have stated that they bear a very close resemblance, than they do in their comparatively slight and orthognathic upper jaw. And it may be emphatically asserted that in the after all not so very common cases in which the early British calvariæ do closely resemble the Anglo-Saxon, the upper and lower jaws will almost invariably be found to furnish means for distinguishing them. The lower jaws procured from long barrows, as from other interments, very ordinarily far outnumber the calvariæ which have been recovered in such a condition as to admit of reconstruction, and there is never the slightest difficulty in distinguishing such a series viewed as a whole from a similar series from an Anglo-Saxon cemetery simply by a reference to the more powerful development of the latter series. It is true that occasionally powerful lower jaws have been found belonging to prehistoric dolicho-cephalic crania. The existence of a '*frons valde depressa*' (a conformation not usual in such skulls) noted by Sir R. C. Hoare (Archæologia, xix. p. 46, 1821) as present in a skull from a long barrow at Stony Littleton may suggest the presence in that skull of a heavy jaw, to counterbalance which the brain-case may have been rotated backwards (see pp. 615 and 623 *supra*). In the eminently dolicho-cephalic (cephalic index 69) Ben-Djemma skull, rendered famous by the history given (Types of Mankind, p. xl) of its presentation by the Oriental scholar Fresnel to the American anthropologist Morton, a strikingly

[1] Herr Mandach, writing of an ancient skull in the Museum at Zurich, says, 'Räthselhaft aber bleibt immerhin das Auftreten dieses fast negerartigen Kopfes inmitten der sonst orthognathen alten Helvetier.' Crania Helvetica, p. 63.

retreating forehead is correlated, Dr. Daniel Wilson informs us (Edinburgh Philosophical Journal, xviii. 1, July 1863, p. 61), with a lower jaw which is 'large and massive, but with less of the prognathous development than in the superior maxillary.' In the Horned Cairn of Get, Caithness, which though not one of the oldest of those cairns did yet contain, as described by Mr. J. Anderson (Mem. Soc. Anth. Lond. iii. p. 220; Proc. Soc. Ant. Scot. June 1868, p. 500), no metallic implements, but on the other hand with other worked flints an arrow-head of the early leaf-shape, a dolichocephalic skull (cephalic index 76) was found, of which Dr. C. Carter Blake writes, *locc. citt.*, 'The inferior maxilla is very large and massive, the chin being excessively prominent; the inferior border is very thick and rounded, the posterior angle of the ascending ramus being rather obtuse. The sigmoid notch is not shallow.' And Virchow has (Archiv für Anthropologie, vi. p. 90, 1873) remarked of the numerous fragments of jaws recovered by Schmerling from the Engis Cave, that the upper jaws have usually a very wide, almost semicircular contour described by their alveolar processes, and have also their teeth very much worn away; and also that the lower jaws are strong, and their middle region much rounded out. Some of these cases may no doubt be considered to have been 'exceptional;' exceptional developments being by no means unknown in pure and pristine races; but I incline to think that in the great majority of cases in wh[illegible]ich jaws have been procured from interments of the stone and bone age the epithets 'thick' and 'heavy' rather than 'well-developed' and 'powerful' will be found to be applicable to them. The segment of the body of such jaws which corresponds to their molar series is very often strikingly strong and even tumid, a development which one is tempted to refer to the stimulation hard food throws upon the teeth firstly and the jaw secondly. The jaw when placed upon a horizontal surface will be found in many cases to touch it by this segment only, the angle and symphysis both lying above it. The chin however and the angle of such jaws are found to contrast greatly to disadvantage with the similar regions of the powerful jaws of male subjects of races such as the Anglo-Saxon; either the depth of the prehistoric jaw of the middle line in front may be found to be markedly short; or when it is, as is sometimes the case, the very reverse of this, this depth is due much more to the alveolar part of the bone than to any increase in size of the triangular raised area of the mentum. A chin conformed in either of these two ways

would have given an expression of feebleness to the face during life. In a really powerful jaw again the inter-angular diameter is wide, the angles approximate to right-angles, and in the region of these angles the jaw itself is flanged outwards, whereas the very reverse of this is usually the case in the jaws from the long barrows. A point less distinctly connected with the physiological development and therefore of proportionately greater morphological value is presented to us in the shortness of the coronoid process relatively to the condyle-bearing portion of the ramus.

In this point these ancient dolicho-cephalic resemble many modern Eskimo crania, indeed the frequency, almost amounting to constancy, with which it occurs in these modern savages is such as to render of less importance the fact that it is sometimes observable in other races both savage and civilised[1]. A second morphological peculiarity of similar significance is sometimes though by no means so frequently constituted by the backward position of the *foramen mentale*, an orifice which in modern European lower jaws opens in the plane of the anterior premolar, but in these priscan jaws sometimes occupies the more backwardly placed position not unusually noticeable in Negros.

The skeletons from the long barrows differ as markedly from those of the round as do the skulls. I have never found the stature to exceed 5 ft. 6 in. (see p. 539 *supra*; Journal Anthrop. Instit. v. Oct. 1875, p. 121) in any skeleton from a barrow which was undoubtedly of the stone and bone period. In this point my results are in close accordance with those of Dr. Thurnam (Further Researches, p. 32), who found the mean stature of the dolicho-cephalic men of the long barrows to be 5′ 5·4″ = 1·661 metre, and that of the brachy-cephalous men of the round barrows to be 5′ 8·4″ = 1·737 metre; the brachy-cephali having thus an advantage of no less than 3″ = 7·6 cent. in the matter of height[2]. To this I

[1] Schaafhausen, *cit.* Ecker, Archiv für Anthropologie, iii. p. 134, 1868, speaks of a massive lower jaw with almost vertically ascending broad and short ramus, the processes of which are almost of the same height as causing us to recognise the rough more aboriginal type of conformation as it is known to us in the old Scandinavians, Celts, and Britons, and as it is in part at least presented to us in an exaggerated degree among modern savages. See Journal of Anth. Institute, July 1876, vi. p. 34, for description of such a lower jaw from the Ancient British Flint-mine at Cissbury.

[2] Mr. J. R. Mortimer, Journal Anthrop. Institute, vol. vi. 3, p. 333, Jan. 1877, has found that the mean stature of his skeletons with dolicho-cephalic skulls is as much as 5′ 9·4″, as against 5′ 5′ for the brachy-cephali, a very different result from those attained to by Dr. Thurnam and myself. The discrepancy however is very easily explained; Dr. Thurnam and I, when we speak of dolicho-cephali, are referring only

would add that whilst this very striking difference is brought out by taking the average length of the two sets of femora, a simple inspection of the two sets of bones puts them into even sharper contrast. The longer femora very often are also the stronger in a most marked degree, and amongst them are to be seen bones with muscular ridges, and processes indicating the possession by their owners of strength far exceeding that usually observable in the skeletons of the earlier race. In like manner other bones indicate unmistakeably that the earlier was also the feebler folk as a whole, though humeri and femora are forthcoming from long barrows which show that men of great muscular power, even if not of great stature, were not wanting amongst the British tribes of the long-barrow period. In some cases the muscular ridges on the long-barrow bones are so well developed on comparatively ill-developed shafts as to suggest the idea of a poorly or only intermittently well-fed population which was constantly worked hardly. The large size of the deltoid ridge on some small humeri has suggested the perhaps fanciful hypothesis that the owners of such bones had been employed in lifting the stones of the huge barrows in which they were found entombed. The *linea aspera* on the femora of the British long barrows examined by me never attains the enormous development which caused Professor Busk and Dr. Falconer to call the femora from the Genista Cave at Gibraltar 'carinate' (see Trans. Internat. Congress, Prehistoric Archæology, 1868, p. 160), and which has suggested the name 'fémur à colonne' (Broca, Mémoires sur les Ossemens des Eyzies, pp. 14–21, Paris 1868; Topinard, Anthropologie, p. 324, 1876) for similar femora from early sepultures. In the absence of this peculiarity [1], as also of the

to dolicho-cephali from long barrows, in which no metallic instruments are found, and all of which are anterior in date to the round barrows with which Mr. Mortimer is dealing. In these latter barrows, as the craniography of them shows, we have, in Yorkshire commonly and to some extent even in the South of England, to deal with a mixed race; and the effect of crossing, as will hereinafter be pointed out in the text, is very usually to increase the size of the mixed races. The only cremation long barrows which have been examined in Yorkshire are those described in this book from Rudstone, Ebberston, and Kepwick. The great majority of the statements here made as to the characteristics of the dolicho-cephalic stock are based upon the examination of skeletons of an unmixed race from the pre-metallic tumuli of Gloucestershire.

[1] Topinard has remarked, *l. c.* p. 325 (if I am right in supposing that the word *crânienne*, line 11 from top of page cited, stands by a misprint for the word *olécrânienne*), that the fluted femur is not found in the same collections of bones as the perforated olecranic fossa. No humerus with such perforation was found in the Genista Cave at Gibraltar, where so many carinate or fluted femora were found by Messrs. Busk and Falconer. I should be slow however to think, as M. Topinard

fluting of the fibula and of the sabre-shape of the tibia which are found to accompany it, these skeletons contrast with many of the probably earlier skeletons described by the authors just referred to.

It has been stated above, p. 646, that many craniographers have found it difficult to distinguish between the crania of the Celtic and the Teutonic races, or, in the words of the German antiquary, between the crania of the 'Steingräber[1],' the analogues of our long barrows, and the 'Reihen-gräber' period. It is almost needless to say that the strength and length and other characteristics of the Anglo-Saxon skeletons found buried with such accompaniments [2] as to justify us in referring them to early periods in the Anglo-Saxon conquest of this island will enable any osteologist to distinguish them from the stone period skeletons.

A more detailed comparison of these two sets of skeletons with each other and with those of the bronze age brings out further points of difference between them, and throws a most instructive light upon the social condition of the respective periods. One of these points is the great inferiority of size of the female skeletons belonging to the earlier period as compared with those of the later, or with the male skeletons of their own times. It is easy to understand [3] how the German women came to be almost equal to the men

does, that the presence or absence of one or other of these peculiarities indicates a difference of race. As I have said in a detailed account (Journ. Anthrop. Instit., Oct. 1875, p. 149) of the Osteology of the long barrow at Nether Swell, I should agree with M. Broca in assigning such perforated humeri to female skeletons, and their presence there I should explain by what follows pp. 659, 660 *infra*, as to the harder lot and slighter build of the females in savage tribes.

[1] A very copious list of synonyms for graves of the stone period is given by Weinhold (Sitzungsberichte d. k. Akad. der phil. hist. Cl., Bd. xxix. Heft. 2, 1859, pp. 119, 121). His words are—'Sie heissen in Dänemark Steendysser, in England Cromlechs, in Frankreich Pierres plates oder Grottes aux fées, in Deutschland gewöhnlich Hünengräber. Andere Namen sind Hünenkeller, Hünentritte, Hünenberge, Riesenbetten, Riesenkeller, Zwerg- oder Quargberge, Teufelsbetten, Teufelsaltäre, Teufelskanzel, Teufelsküchen, Steinhaüser, Steinöfen, Carlsteine, Schluppsteine, Weinberge.' For the single variety of Steingräber which is known as Hünenbetten, and corresponds to our 'long barrows with peristaliths' (for which see Thurnam, Archæologia, xlii. 1869, p. 51), there exist the following German (*l. c.* p. 121) synonyms: Hünenhügel, Hünenstatt, Hünenburg, Hühnentritt, Hühnenkirchoff, Riesenbetten, Riesenberg, Teufelsberg, Bulterbelt, Dansenstein, Danzelstein, Danzelberg, Steintanz, Sonnenstein, Wulfstein, Steinkirche, Steinkreis. This multitude of names is a proof of the age of these monuments, nearly as convincing as the presence of stone- and bone- and the absence of metallic implements.

[2] For an account of these accompaniments see Archæologia, xlii. 1870; Excavations at Frilford, p. 436 *seqq.*

[3] Dr. Leonard Schmidt, art. 'Germania;' Smith's Dictionary of Greek and Roman Geography, p. 995.

both in strength and in size when we read (Tacitus, Germania, cap. 16) that their marriage-presents of *juncti boves, paratus equus, data arma* were intended to teach them symbolically *venire se laborum periculorumque socias, idem in pace, idem in prœlio passuras ausurasque.* In women subjected to such equal trials, and incited to such equal aspirations, the great sexual disparities at once of a physical, moral and intellectual nature, which have so often been noted as well in more civilised as in more savage communities, would on principles of natural selection tend to disappear. That the series of skeletons from the bronze period also contrasts and in the same way with the series from the stone and bone period, may be gathered from the fact that in the series from the later period there is from time to time a difficulty in distinguishing the sex of the skeletons when the entire number of the bones are not preserved, a difficulty which scarcely ever arises in the cases of pre-metallic skeletons. The subequality in size of the sexes in the Gallic races was expressly noted by Diodorus, and many other writers, ancient as regards our times but entirely modern as regards the long-barrow era, have, as I have pointed out above, p. 565, remarked that in Celtic, no less than in German tribes, both sexes exposed themselves to the same risks in war. To the British of the time of Boadicea, Tacitus[1] tells us (Ann. xiv. 35), it was *solitum feminarum ductu bellare*[2]; and the presence and participation of women in governments, battles, and massacres is repeatedly mentioned by the same writer (see Agricola, 16, 31, 32; Germania, 8; Ann. xiv. 30. See also Diodorus, v. 32, 39; Strabo, iii. 4, 17, 18, vii. 2, 3; Dio Cassius, lxii. 4; and *supra*, p. 565).

The words of Dio Cassius[3], a historian deserving, even as

[1] Tacitus of course is writing (*locc. citt.*) of races whom the antiquary would speak of as 'late Celts,' but the physical subequality which this community of risks as incurred in his days must have entailed had existed in the much earlier bronze age; and the brachy-cephalic type persisted not only through the late Celtic period, but, as the examination of the Oxfordshire Crawley tumulus carried on by Mr. Akerman, Dr. Thurnam, and myself have shown, to a much later period. Indeed in this tumulus the crania were almost exclusively brachy-cephalic, and to a most marked degree, while the skeletons possessed the size and strength already described (pp. 641, 655 *supra*) as being usually found to characterise the trunk and limb bones to which such crania appertain. For an account of the Crawley tumulus, see Akerman, Archæologia, xxxvii. p. 432; Thurnam, *ibid.* xlii. p. 175.

[2] See p. 565 *supra*, and Bates, 'Naturalist on the Amazons,' ii. 132; Clements Markham, 'Travels in Peru and India,' p. 159; Rochholtz, Deutsche Glaube, ii. 289.

[3] *Βουνδουΐκα γυνὴ Βρεττανίς, γένους τοῦ βασιλείου, μεῖζον ἢ κατὰ γυναῖκα φρόνημα ἔχουσα . . . ἦν δὲ καὶ τὸ σῶμα μεγίστη καὶ τὸ εἶδος βλοσυρωτάτη τό τε βλέμμα δριμυτάτη· καὶ τὸ φθέγμα τραχὺ εἶχε· τὴν τε κόμην πλείστην τε καὶ ξανθοτάτην μέχρι τῶν γλουτῶν καθεῖτο.* 'Boadicea, a British woman of the royal family, had more than

abridged, of being more frequently quoted than he is, as to the size and appearance of the British heroine, give us some colour of reason for suggesting that Boadicea may have possessed the cranial conformation characteristic of the bronze age, rather than that which we have at Arras in the East Riding and elsewhere found in interments with the archæological accompaniment of the late Celtic or early Iron period in this country.

On the other hand, a collection of the trunk and limb bones from one of the long barrows described above as examined in the neighbouring county of Gloucester (as *e.g.* p. 538 *supra*) contrasts in no point more strikingly with a similar collection from such a tumulus as the one at Crawley than in the disproportionate slightness and shortness of the female skeletons. The average difference in civilised races in the stature of men and women may be taken as about four inches, being in England at present the difference between about 68″ and 64″; twice this difference will very usually be found to exist between the male and female skeletons of the stone and bone period, being the difference between about 66″ and 58″. The male skeletons of this period contrast to disadvantage with the male skeletons of each and all of the races who have inhabited this country since the introduction of metal into it; but the difference between the female and the male skeletons of this early period is a very much greater difference than any which can be shown to arise out of the comparison of any other two sets of adult human bones from cemeteries in this country. This difference is perhaps more strikingly shown by a comparison of the male and female collar-bones than by that of any other bones of the skeleton; and it enables us to reproduce for ourselves the narrow chest and drooping shoulders which must have given their owners an appearance of great feebleness during life. It has been noted by Professor Busk in the skeletons from the Gibraltar caves (see Trans. Internat. Congress, Prehist. Archæology, 1869, p. 158), and I have noted it in every case in which the trunk bones have been recovered from long barrows. It is as marked in the

a woman's spirit. She was of very large bodily proportions; the fierceness of her appearance struck beholders with awe; the expression of her countenance was exceedingly severe and piercing. Her voice was harsh, and she had a profusion of very light hair, which reached down to her hips.' Lib. lxii. 701, ed. Leunclavii, 1606. It is not impossible to reconcile this account with Martial's lines, xi. 53–56:—

'Claudia cæruleis quum sit Rufina Britannis
Edita quam Latiæ pectora plebis habet.
Quale decus formæ, Romanam credere matres
Italides possunt, Atthides esse suam.'

female clavicles from the cremation long barrows of Market Weighton and Crosby Garrett as in the non-cremation long barrows of Gloucestershire.

As regards the skeletons of the stone age which have been examined in this country, the aphorism enunciated by Dr. Kuhff (Révue d'Anthropologie, iv. 3, 1875, p. 435) to the effect that 'plus s'on se rapproche des origines de l'homme, et plus l'on voit s'effacer les caractères différentiels sexuels dans la squelette' appears to me to be the very reverse of the actual state of the case, though the skulls are not rarely subequal in the two sexes. The reason for this disproportion[1] lies in the facts of the earlier attain-

[1] The greatest discrepancy in the stature of the two sexes recorded by Weisbach in his measurements in the Anthropological part of the Voyage of the Novara (1867, p. 217) is that observed in the Javanese, where the males were found to average 1679 mm. = nearly 5′ 6″ in stature, as against 1461 mm. = nearly 4′ 9·5″ for the females. The Rev. Richard Abbay, Fellow of Wadham College, tells me that the Javanese women are put to very hard labour, carrying enormous weights upon their backs. The philologist who may be inclined to explain the existence of Turanian or non-Arian traits in Welsh and Irish grammar, by supposing that these traits are the result of the assimilation by bronze-importing Celts of the supposed non-Aryan tribes of the stone age, may be interested in comparing the following account of the treatment of the Mongolian female in modern days with the foregoing description of the osteological characters of the female of our long-barrow period. The Rev. James Gilmour, Medical Missionary at Peking, writes thus in the Eleventh Report of the London Missionary Society's Hospital at Peking, 1875, p. 37: 'The women of Mongolia are hardy and capable. They look ruddy and strong-limbed. They work hard, and are badly treated. Woman's place in the tent is next the door; the felt she sleeps on is the thinnest and poorest. She does the milking and the drudgery generally, and when she sits in the tent, usually has nothing better than a worn cow-hide to protect her from the damp and cold of the ground. She jumps into the saddle and rides over the plains as recklessly as a man. She takes little care of herself, and has little care bestowed upon her. An old woman spoke some truth, at least, when she said to me, "The women are treated like the dogs which are fed outside the tent." The result is as might have been expected: strong, hardy and healthy as the women look, almost every one who has passed the stage of girlhood has some chronic malady or suffering. There are many exceptions, especially among the richer class; but as a rule, women suffer more, age sooner, and die younger than the men; and there is little prospect of a change for the better in this respect, till women are treated more considerately, and have accorded to them a fair share of the meagre comforts of tent-life.' Diodorus Siculus, again (v. 39), after dwelling with emphasis on the hard life of the race which Vergil speaks of as *assuetum malo Ligurem*, says that the wives take an equal share with their husbands in all their toils and endurances. The craniographer may object to the relevancy of these striking passages, on the ground that the Mongolian are a brachy-cephalic and the long-barrow folk, like the Basques, a dolicho-cephalic stock. To this the non-anatomical enquirer might reply that the question was not one of human osteology, but of human motives and behaviour; but writing as a craniographer I will answer, firstly, that I have received from Professor Eichwald a Tartar skull from Kazan with a cephalic index of 76, and a very close general resemblance to the Eskimo type; and secondly, that most ethnographers are agreed, dolicho-cephaly notwithstanding, to consider this latter stock as unmistakeably Mongolian. For the Australians, whom their mode of life and command

ment of puberty by females than by males in our species, and the earlier consequent consignment of the females, in savage varieties of it, to the growth-arresting processes of child-bearing, and of hard work on a frequently poor and intermittent supply of food.

It has often been stated that in savage races the cubic capacity of the skulls of the women makes a nearer approach to that of the men than it does in modern civilised nations, and there is no doubt that this has often been found to be so. But I have to repeat (see p. 565 *supra*) that this is by no means invariably the case, and that in the long barrows, alike of Gloucestershire and Yorkshire, I have found female adult crania which contrast with the male skulls by their disproportionate smallness, almost, or altogether as forcibly as do the clavicles or the long bones. Having taken up these diminutive skulls myself, I can point out that they were found together with other skulls, male and female, which differed from them greatly in size, but in no way as to the archæological surroundings; and that there is no reason for supposing, therefore, that their smaller size is to be explained by reference to any inferiority of rank which among savages has so often been observed to entail inferiority of bulk (see British Association Report, Bristol Meeting, 1875, pp. 150–152). We are prone, as I think, by a certain confusion of thought, to imagine that savage life is as unvarying and monotonous, and as little relieved by alternations, as is the 'dull grey life' of the lowest ranks of highly civilised communities, and that in consequence greater uniformity of physical conformation is to be expected and

or want of command of its comforts as well as some other peculiarities have caused to be compared with the stone age inhabitants of this island, Dr. Barnard Davis gives an average male stature of 5′ 6″, and an average female stature of 4′ 11·5″,—measurements showing a disproportion nearly identical with that which I have pointed out as characterising the race we are here dealing with. The Amakosa Kaffirs of the Cape of Good Hope have, I was assured by the late Sir A. Smith, an average stature of 5′ 8·5″ for the males, as against one of 5′ 0·5″ for the females. On the other hand, amongst the Eskimos, to whom, as to the Australians, these prehistoric races have been compared, I do not find that a similar disproportion exists in the stature of the two sexes, though Sir John Richardson (Polar Regions, 1861, p. 303) does speak of 'the discomforts which age entails in savage life, especially on the weaker sex,' as having made the old women 'frightfully ugly,' and 'the presence of a cheerful and pleasant-looking old woman' as 'rare indeed among them.' The stature of the male Eskimo as given by Peschel (Volkerkunde, p. 87), citing Beechey, is on an average 5′ 5″, and exceeds that of the female by only 4″. I must express my regret that Dr. Emil Bessels should have been so unfortunate as to lose his measurements of the stature of the Eskimos, whose ethnology owes so much to his interesting paper in the Archiv für Anthropologie, viii. 1875, p. 109. The results of these measurements might perhaps have given us a different average from that just quoted. A few additional references to the significance of this disparity of stature in the sexes may be found in the Archæologia, xlii. 1870, p. 457, and Journal Anth. Inst. Lond., Oct. 1875, p. 121.

to be found among all the members of wild and prehistoric races. The assumption, and the inference based upon it, are equally unsubstantial; savages are exposed to greater vicissitudes in their battle alike with inanimate and animate forces than are the veriest outcasts of civilised society; and as regards the means of meeting these emergencies, compared with savages 'our basest beggars are superfluous.' 'The action of the environment,' 'l'influence des milieux,' counts really for more instead of for less upon savage than upon civilised man; and as a matter of fact this more potent working is as distinctly verifiable upon the living modern savage as it is upon a series of bones from the stone-age barrows. Mr. Bates, *e.g.* says, when (Naturalist on the Amazons, vol. ii. p. 129), writing of a Brazilian tribe, the Mundurucús (whom, he says indeed, p. 131, it would be a misnomer to call 'savages; their regular mode of life, agricultural habits, loyalty to their chiefs, fidelity to treaties, and gentleness of demeanour giving them a right to a better title,' but who nevertheless, on his own showing as to details such as dress, &c., p. 125, appear to have owed very little to civilisation and the arts): 'The great difference in figure, shape of head, and arrangement of features amongst these people struck me forcibly, and showed how little uniformity there is in these respects amongst the Brazilian Indians, even when belonging to the same tribe. The only points in which they all closely resembled each other were the long thick straight jet-black hair, the warm copperybrown tint of the skin, and the quiet rather dull expression of countenance. I saw no countenance so debased in expression as many seen amongst the Múra tribe, and no head of the Mongolian type, broad with high cheek bones, and oblique position of the eyes, of which single examples occur amongst the semi-civilised canoemen on the river.' The fact, finally, of the existence in certain uncivilised races of a far greater difference between the skulls of the women and those of the men than that which exists in European races, is put forward with emphasis by Dr. Zuckerkandl, in the Reise der Novara, Anthrop. Thiel. i. 1875, p. iii; and, besides proving, when compared with the utterances of Retzius, Huschke, and Broca, to precisely the opposite effect, the variability of savage female crania, brings, when compared with the results of an examination of female long-barrow crania, a fresh illustration of the importance of collecting, while yet we may, all the available facts for the illustration of ancient savage life.

In saying that the dolicho-cephalic skeletons of the long-barrow

period contrast in the points of strength and stature to disadvantage with those of the bronze age, it is by no means intended to assert that ill-filled skulls and stunted skeletons are never to be found in the brachy-cephalic series. The very reverse of this indeed has been already, p. 589, pointed out as being the state of the case. The races of the bronze age were in possession of larger means for carrying on the battle of life than those of the stone age; still, they lived in latitudes which we are sometimes tempted to think are only made endurable by the command of glass, and coal, and iron; and they must, like races in more modern times in a somewhat similar stage of development, have from time to time suffered greatly from famines. Suffering from scarcity of food at a critical period of growth is sufficient to stunt the stature of individuals even of tall races who may be subjected to it. The chiefs would be less liable than the common people to be so affected; Mr. Bates indeed tells us of a Brazilian tribe (Naturalist on the Amazons, ii. p. 127), how the 'footmarks of the chief could be distinguished from the rest by their great size and the length of the stride;' still, a long continued succession of murrains and bad harvests would affect all classes alike, even in the bronze as well as the stone age. The stature would be more likely to be affected by the operation of such times of scarcity than would the size of the head, as it goes on increasing for so many years, possibly years of scarcity, after the full proportions of the cranium are attained to[1]. But small and ill-filled skulls as well as short skeletons are to be found in the brachy-cephalic[2] as well as in the dolicho-cephalic series, even if not

[1] The average circumference of the head has been shown by Liharzig (Das Gesetz des Wachsthums, Tab. v. and vi.) to be but a little over an inch less in either sex at the age of fourteen than it is in adult life, the exact measurements giving a difference of 3 centimètres = 1·181″ for each sex, and being 54 : 57 centimètres for males, and 52·5 : 53 5 for females. The potential increment of the stature subsequently to the age of fourteen averages, according to the same authority, 12 centimètres = 4·72 inches for males, being the difference between 163 centimètres = 64·17 inches, and 175 centimètres = 68·89 inches; and 12 centimètres = 4·72 inches for females, being the difference between 161 centimètres = 63·38 inches, and 173 centimètres = 67·11 inches. But here Liharzig appears to underestimate the average difference between the sexes at the age of twenty-five. See Taff. iv. and v. and p. 15.

[2] Such for example are the brachy-cephalic skulls of which a record is given under the following titles and at the specified pages of this work:—'Goodmanham, cxvii. 1,' p. 326; 'Rudstone, lxiii. 3,' and '6,' p. 248; 'Rudstone, lxvi. 1,' p. 254; 'Rudstone, ccxxxiv. 4,' p. 555; 'Weaverthorpe, xlvi. 4,' p. 200; 'Weaverthorpe, xlvii. 5,' p. 195; 'Brough, xxi. 6,' p. 163; 'Flixton, lxxi. 6,' p. 276; 'Sherburn Wold, ix. 2,' p. 148. With these skulls may be compared the Ancient British Skull from Codford figured in the Crania Britannica, pl. xiv., by Dr. Barnard Davis; in the Canadian Journal, No. xli., Sept. 1862, by Professor Daniel Wilson, and stated to have a cubical content of

in equal proportion; their smaller numbers being correlated with their greater command of means, such as metal and cerealia. I have elsewhere given[1] at length the peculiarities which are

82 cub. inches, a circumference of 20 inches, and a cephalic index of 83. Such again is the Danish cranium from Moen, a cast of which (No. 5710) may be seen in the Museum of the London College of Surgeons; and such would appear to be the skulls described by Hölder as the female form of his 'Ligurian' type, Archiv. für Anthropologie, ii. p. 55. As also the female skulls described by me, Archæologia, xlii. p. 457.

[1] See Journal Anthrop. Instit. Oct. 1875, vol. v. pp. 124, 125, where I write as follows:—

'By an "ill-filled" skull, Professor Cleland tells us, he means a skull the exterior surface of which is marked by a "mesial and two lateral ridges on the roof, with flatness of the adjacent surfaces," which has "its position of greatest breadth high up upon the parietal bones." The mesial carina may, I would add, be prolonged in such skulls over the frontal bone, and the frontal tubera may retain their infant-like prominence. To these peculiarities I would further add the presence of two depressions on the exterior of the skull, corresponding to convexities on its interior surface, as completing in many ancient and modern savage crania the character of "ill-filledness." One of these depressions is well known as the "post-coronal furrow," but inasmuch as the mesial vertical carina often developed in male skulls may be, and often is, continued along the line of the sagittal suture, so as to divide the so-called "furrow" into two parts, this name is not a happy one. The second of these depressions corresponds to a part of the parietal bone which lies a little above its posterior inferior angle, and immediately, therefore, above the part of the bone which is furrowed internally for the lateral sinuses. As in the former case, an inward growth corresponds to the outwardly visible concavity, so that much such an appearance is produced as we can imagine would have resulted from pinching in the skull walls over this area, had they been plastic. I have been able to demonstrate the rationale of these depressions in the following manner. By removing from a skull, with its brain *in situ*, the greater part of its roof, but leaving of this structure one antero-posteriorly-running arch of bone, corresponding to the sagittal, and two transversely-running half-arches, corresponding respectively to the half of the coronal and the half of the lambdoid sutures on one side, the exact position of all the main convolutions and fissures of the brain can be shown in their normal relations to these landmarks in the vault of the skull. It will make the matter plainer, and at the same time facilitate the production of similar preparations in other museums, to say that a brain under such surroundings, presents something of the appearance in the skull which a living head does when subjected to measurement in such a cephalometer as that of M. Antelme (see Mem. Soc. Anthrop. de Paris, tom. i. pl. vi. fig. 2). By means of such a preparation it is easy to show that the post-coronal depression in the roof of the skull does not correspond, as supposed by the late Dr. Thurnam (Nat. Hist. Review, April 1, 1865, p. 267), to the fissure of Rolando, but to the deep, often wide, fissure which divides the superior frontal convolution into two well-defined lobes, and abuts upon the ascending frontal convolution by a terminal bifurcation into two arms of considerable length. This fissure, as is well known, exists, and has often been described and figured, in the brains of the anthropomorphous apes, in the crania of which animals the post-coronal depression is sometimes indicated when the sagittal carina is absent. Similarly, the second of the depressions which I have noted as commonly present in the postero-inferior part of the parietals of "ill-filled" skulls, may be seen to correspond to a certain multi-radiate fissure frequently noticeable on the posterior or convex aspect of the middle tempero-sphenoidal convolution, but as far as I know, not named by any of the numerous writers who have followed Gratiolet in describing the convolutions and fissures of the cerebrum.

'Professor Bischoff however, in his well-known paper on "Die Grosshirnwindungen des Menschen" (in the "Abhandlungen der k. Bayer-Akademie der Wiss." ii. Classe,

intended to be implied by the application of Professor Cleland's expressive epithet 'ill-filled;' I may here add that a good *rationale* of most of them, such for example as their wall-sidedness, their retention of the prominence of frontal and parietal tubera, and the stops on either side of their sagittal vertical line, is given in the metaphysical expression 'the retention of an infantile type,' which refers us to causes such as scarcity of food which arrested potential growth. The fact that the dimensions of the parietal bones are usually less affected by any general stunting to which skulls may have been subjected than those of either frontal or occipital is a very striking illustration of this, it being well known that the two latter factors of the brain-case attain their normal relation to the parietal only after several years of childhood with its numerous liabilities to disease and distress have passed away. None, however, of these prehistoric skulls have exhibited that extreme lowness and smallness and precoronal depression of the frontal bone which is seen in some of the skulls from the Melanesian Islands and Australia, though in some of the hypsistemo-cephali of the long barrows we do observe that relatively greater prominence of some one segment in the anterior half of the parietal in the sagittal line which is often observable in skulls of this kind (see Dr. B. Davis, Natuurkund. Verhand. Haarlem 1866, Deel 24, Pl. i. fig. i; Busk, Anthrop. Instit. vi. 3, Jan. 1877, Pl. ix–xii).

The small skulls of which I am speaking are sometimes, and especially when belonging to males of the brachy-cephalic type, of considerable textural solidity [1], but I incline to think that it is more

x. Band, ii. Abtheil. 1868, pp. 448, 450, 495; or "Separat Abdruck," pp. 58, 60, 105, Tafel x. fig. 7), speaks of certain fissures, without any well-defined character, which appear on the boundary between the parietal and occipital lobes, and says that they correspond to a "fissura occipitalis externa" which appears in the human fœtus, but is normally limited in duration to the seventh and eighth months of intra-uterine life. Though brachy-cephalic skulls have not, as yet, been proved to have been found in Great Britain in any primary interments in the barrows of which I am writing, and though brachy-cephalic skulls from the United Kingdom, and indeed, I am inclined to think, from European countries generally, are ordinarily well- and not "ill-filled" skulls, it may, nevertheless, be allowable to say here that the "brachy-cephalic angustiores" (see Phil. Trans. 1870, p. 148), as Professor Cleland would call the brachy-cephali of several other parts of the world, frequently present the depressions of which I have been writing. An excellent instance of the postero-parietal inward pinching of the skull-walls was furnished to me quite recently by a Maori skull presented to the University Museum by Dr. Batt, the skull having a latitudinal index of 79, and possessing also markedly the contour which induced Retzius to class the Maoris as brachy-cephali.' Since writing as above, I have noted on both sides of the brain of a Malay a depression which must have had a very considerable postero-parietal depression of the cranial walls corresponding to it.

[1] Such is the Ancient British Skull from Codford described by Dr. B. Davis, Cran.

usual to find their ill-nourished character expressed by a slighter structure and a lesser relative weight as well as by their smaller dimensions. As I have already hinted (see pp. 589 and 640 *supra*), I am inclined to think that it may have been the mal-nutrition of such skulls as these which gave origin to the hypothesis of a Lapp population having existed in prehistoric times in Denmark, South Sweden, and in these islands. Latitudes much further south than Great Britain went undoubtedly through a reindeer period, but, without questioning this, we can stop short of averring that the men who domesticated these animals in prehistoric Southern Europe were of the same stock as the men who domesticate them now in Northern Europe. The skulls of the modern Lapps do not closely resemble either the stone and bone period skulls, or our bronze period skulls; neither of these periods coincided with the reindeer period, whilst in both of them small stunted crania are found mixed up with large ones, and that too in the tombs 'of the kings[1].'

To obtain however any really satisfactory *rationale* of the difference between brachy-cephaly and dolicho-cephaly we must go beyond examination simply of the texture, relative proportion, and capacity

Brit., pl. 14, as being 'dense in its structure and rather heavy;' and such are a considerable number of skulls of the Romano-British period described by me as found at Frilford, Archæologia, xlii. p. 458.

[1] A considerable amount of discussion upon the subject of the Lapp hypothesis took place at the Meeting of the International Congress of Prehistoric Anthropology and Archæology held at Stockholm in 1874; the opinions of the following authors, mostly in disfavour of the hypothesis, will be found at the pages of the Compte Rendu of the Congress (published last year, 1876) which I append to their names:—Rygh, pp. 178-179; Montelius, p. 194; Worsaae, p. 208; Gustav Retzius, pp 231-233; Schaaffhausen, p. 841; Virchow, p. 848; Baron von Düben's views, pp. 691-692, have already been quoted, p. 629 *supra*, and the following extract from Mr. Smiles' 'Life of a Scotch Naturalist, Thomas Edward,' 1876, p. 357, looks a little strange when compared with it: 'It is probable that a great part of Europe was originally peopled by Lapps, and that they were driven North by the incoming of a more civilised race from the East. There are still remnants of the Lapps in the island of Malmön off the coast of Sweden, in North Connaught, and the Island of Aran in Ireland; in the Island of Lewis off the Western Coast of Scotland, and in several of the Shetland Islands.'

So far as I know, Professor Nilsson's (Skandinaviska Nordens Ur-invanare, Lund 1838-1843, Hft. 3, p. 12) and Professor Rask's names are connected with the origination of this hypothesis. The views of the former of these authors appear to have been considerably modified in the thirty years' interval between 1838 and the publication of an English translation of his work under the editorship of Sir John Lubbock (see p. 122 of this translation).

The views of the elder Retzius may be seen in Müller's Archiv, 1845, or Ethnologische Schriften, 1864, p. 20; and Müller's Archiv, 1849, and Ethn. Schriften, p. 102. The small skulls described by Retzius, from Marly and Meudon near Versailles (Müller's Archiv, 1847, p. 499, and Ethn. Schriften, pp. 62-64), furnish instances of stunted skulls the existence of which can be explained as in the text.

of the skulls, and must enquire what the conformation of the covering skull can teach us of the conformation and character of the contained brain. As I have already pointed out (p. 638), Huschke, nearly a quarter of a century ago, stated of certain readily recognisable landmarks on the skull, such as the frontal and parietal tubera and the coronal and the lambdoidal sutures, that certain equally definite and recognisable brain-convolutions would be found to correspond with them. These important observations, owing probably to their being mixed up with a vast mass of matter of less precision and interest, failed to attract the attention which they deserved, and a considerable number of investigators, including myself[1], have subsequently to the appearance of Huschke's memoir in 1854 examined the relation of brains and skulls *in situ* without any knowledge of his precedence, but with the result of confirming his statements. Of these there are two which are of eminent importance for our present purpose, the one namely which allocates the supra-marginal convolution of the brain to the parietal eminence in the skull (see Huschke, Schädel, Hirn, und Seele, p. 142); and a second, according to which the internal perpendicular or parieto-occipital fissure[2] holds a similar relation to the lambdoid suture (Huschke, *l. c.* pp. 62, 142). For as I have already said (p. 637), of all the peculiarities distinguishing the brachy-cephalic from the dolicho-cephalic skull, at least in European races, there is none more important and more striking, even from a merely craniological point of view, than the difference existing between them as to the distance intervening between the plane of the parietal eminences and that of the back of the skull. When however we come to look

[1] Professor Broca in France, Professor Turner in England, M. Ferdinand Heftler in Russia, and Professor Bischoff in Germany, have connected their names with this investigation; an account of their labours is given by Professor Broca in his memoir 'Sur la Topographie Cranio-Cerebrale,' published in the Revue d'Anthropologie, tom. v. No. 2, 1876.

[2] Professor Turner (Journal of Anatomy and Physiology, Series ii. No. xiii. Nov. 1873, p. 145) says that the 'exact distance of the parieto-occipital fissure from the apex of the lambdoidal suture varies, partly from variations in the brain itself, and partly from the not infrequent variations in the mode of ossification of the upper squamous part of the occipital bone. About 0·7 or 0·8 of an inch will express its average distance from the apex of that suture.' In this Professor Turner differs from Ecker, Arch. für Anth. ix. 1876, pp. 72 and 76; and from Broca and Bischoff, *citt. in loco*. Broca, in the Revue d'Anthropologie, tom. v. No. 2, 1876, says: 'La scissure occipitale externe correspond assez ordinairement chez les adultes de notre race à la suture lambdoide, à quelques millimètres pres; toutefois elle peut s'en écarter davantage, soit en dessus, soit en dessous.' These statements are mainly of importance as bearing upon the variability of the occipital lobes, to which reference has been made above and will be also in the next note.

into this difference a little more closely, we find that if we take for our posterior limit, not the posterior aspect of the skull but the plane of the lambdoid suture, the two varieties of skull are just as clearly differentiated as before. For the relative proportions of that portion of the cerebral cranium which is constituted by the superior squama occipitis and lodges the occipital lobe proper, and the relative proportions of that lobe itself, are exceedingly variable[1]

[1] The occipital lobe is supplied exclusively by the posterior cerebral artery, which, on account of the angle which it makes with the main trunk whence it arises, the basilar, namely, or, on the right side, very frequently the internal carotid, as also on account of its great length, must work at very considerable hydraulic disadvantage. What the peculiar course of the artery would lead us to anticipate, the peculiarities of the veins of this portion of the cerebrum confirm us in holding. One of the largest of the Pacchionian bodies is ordinarily found at the point where the veins of the occipital lobe enter the superior longitudinal sinus, this point being upon the line of the parieto-occipital fissure, and corresponding with what is usually the most posteriorly placed of the *foveæ glandulares* in the skull. Now the bodies known as Pacchionian glands are growths which in their normal state are but $\frac{1}{10}$–$\frac{1}{2}$ mill. in size, and which owe the increase in size which makes them prominent to the eye and impresses them on the skull to venous congestion. The very constant presence therefore of a largely hypertrophied Pacchionian body upon the embouchure of the occipital veins is a significant fact as regards the retardation of their current (Wilks and Moxon, in their 'Pathological Anatomy,' p. 208, compare these bodies to the papillose outgrowths sometimes seen on the surface of the liver in cases of extreme cardiac congestion). The amenability of the Pacchionian bodies to pathological change is recognised by Rokitansky, 'Pathological Anatomy,' English translation, 1850, vol. iii. p. 329, or 2nd German edition, 1856, vol. ii. p. 407; by Jones and Sieveking, in their 'Manual of Pathological Anatomy,' edited by Dr. J. Frank Payne, 1875, p. 237; by Wilhelm Krause, in his 'Handbuch des Menschlichen Anatomie,' 3rd ed., 1876, p. 460; and finally by Luschka, who was, as far as I know, the first to draw attention to the fact that in their earlier stages and smaller size these bodies could not be considered other than normal growths, in his 'Anatomie des Menschen,' 1865, Bd. iii. Abtheilung ii. p. 240.

The histological inferiority of the occipital lobe is well known, and though Mr. Lockart Clarke may slightly overstate the case when he says (Maudsley, Physiology of Mind, 3rd edition, 1876, pp. 112 and 114) that 'all the nerve-cells are small,' both Professor Turner (Introduction to Human Anatomy, part i. 1875, p. 283) and Professor Henle (Handbuch der Syst. Anatomie, iii. 2, p. 276) would allow that 'the greater number of the cells of the occipital lobe are small and nearly uniform in size,' and, what is of equal importance, that the superficial layer, which is everywhere poor in cell-elements, is of greater width in the occipital than in any other region of the brain. Meynert's words (Stricker's Manual of Human and Comparative Histology, English translation by Power, vol. ii. p. 391, 1872) are eminently to the purpose: 'The brain of monkeys, which is distinguished by excessive development of the occipital lobes, contains this type of tissue (the pyramidal cells) in much greater abundance than the human brain.' Dr. Herbert C. Major has given an instructive account of the histology of the brain of the Chacma Baboon in the Journal of Mental Science, Jan. 1876, and refers therein to Meynert's memoir, *l. c.*

As regards the connexion of the occipital lobes with mental functions, it is well known that Neumann (*cit.* Cruveilhier, Anat. Descript., ed. 1836, iv. p. 668; Longet, Système Nerveux, i. 691, and Traité de Physiologie, 1869, iii. p. 444) was induced from his examination of the brains of some fifty insane persons to hold that intelligence had its seat in the occipital lobes; and Cruveilhier is also quoted as speaking in the

in each variety of skull, and are not (see p. 638) distinctive of either. A zone therefore bounded in front by a line drawn over

same sense (Anat. Descript., *l. c.*, and 2de ed., Paris, 1845, tom. iv. p. 346) from having noticed that in senile dementia the occipital lobes are much more atrophied than the frontal. These arguments, like so many in the same sphere, are amenable to the objection that the atrophy in question may be merely a concomitant change, correlated in the way of mal-nutrition with some other really causative change, without being itself the first term in the series of evils. It is however by no means necessary to shelter ourselves behind this suggestion, for few if any mental alienists would be found to take this view at the present time. In the last edition indeed (1870, iii. 2, p. 454) of Cruveilhier's Anatomie Descriptive I find the words 'C'est sur ces circonvolutions occipitales que porte principalement l'atrophie sénile,' standing without note or comment or inference in connexion with them, and the reference to Neumann is omitted. But what is of much greater consequence is to find an authority with the vast experience which Dr. J. Crichton Browne possesses (see West Riding Lunatic Asylum Reports, 1876, vol. vi. p. 218) averring that the exemption which the occipital lobes on his showing enjoy from the lesions characteristic of the general paralysis of the insane, is 'as it were only part of a wider immunity from visible pathological change' which they enjoy 'in all varieties of chronic insanity,' inclusive (p. 178) of 'senile, simple, and consecutive dementia.' Dr. Fox in like manner in his 'Pathological Anatomy of the Nervous Centres,' 1874, p. 41, tells us that 'the posterior lobes are less often affected than the middle, and hemorrhage there seems to be of far less serious import.' To these statements it may be well to add the following made by Professor Schröder van der Kolk (Pathology and Therapeutics of Mental Diseases, English translation by J. T. Rudall, Melbourne, 1869, p. 46), 'In insanity proper, in cases of confusion of ideas, and of haughty insanity, I have always found the anterior lobes of the brain suffering, but on the contrary in the melancholic and those who condemned themselves with or without religious admixture, I have found the upper and posterior parts of the lobes diseased, and that in the latter cases the understanding often showed no traces of disturbance, inasmuch as the individuals judged correctly and disputed acutely. The pathological affection limits itself then to the upper and hinder parts of the lobes, and in the fore parts nothing abnormal is seen in regard to colour, firmness, and connexion with the pia mater. In those who at last finished with dementia I never found the anterior parts of the lobes intact.' Cf. also pp. 24, 41, 44, 59, 63, 93, *l. c.*

Dr. Lelut, the author of a memoir 'Du développement du crâne dans ses rapports avec celui de l'intelligence,' published in the 'Gazette Médicale de Paris,' has been referred to by M. Foville (Système Nerveux, 1844, p. 649) and by Virchow (Gesamm. Abhandlungen, p. 916) as having shown that in the cases of idiots the greatest diminution of the skull takes place in the posterior part of its circumference. Neither of the authors who refer to M. Lelut accept this conclusion; and a reference to Professor Marshall's paper in the Philosophical Transactions for 1864 (p. 543, pl. xxi, xxii, xxiii), 'On the Brain of a Bushwoman and on the Brains of two Idiots of European Descent,' will show that the facts upon which it is based may very readily be overstated, the real state of the case as regards the brains of these idiots being that 'whilst all parts have been more or less arrested, the frontal and occipital lobes have suffered more than the temporal or parietal.'

The comparative anatomy of the brains of men and apes shows that the occipital lobes have a greater relative development in the lower than in the higher apes, and it has been maintained by Dr. A. Pansch (De Sulcis et Gyris in Cerebris simiarum et hominum, 1866, p. 25; Archiv für Anthropologie, 1869, iii. p. 252) that the 'operculum' which bounds the parieto-occipital fissure posteriorly is to be considered an upgrowth which is sometimes much diminished in the Anthropomorpha, and which is only rarely to be seen, except rudimentarily represented, in man. In other words, the external perpendicular or occipito-parietal fissure is a valley formed not by depres-

the centre of the parietal eminence and parallel to the line of the lambdoid suture, and behind by that line itself, may, with the zone of brain which has been shown to underlie it, be taken as eminently distinctive, according to its lesser or greater width, of the brachy-cephalic and dolicho-cephalic types of skull respectively.

As some difference is found in the statements of different writers as to the constancy, if not of the relations held by the supra-marginal lobule to the parietal tuberosity, still of those of the parieto-occipital fissure to the lambdoid suture, it is well to say here that I have examined these relations as existing between the skull and the brain while *in situ*, and have measured the width of the zone in question in many brains removed from the skull. The ordinary width of this zone in the brains of the almost exclusively dolicho-cephalic population of this part of England is from 1·5″ to 2″; in such a skull, with a breadth-length index of ·76, having ascertained by boring that the centre of the supra-marginal lobule corresponded to the centre of the parietal eminence, I found that the distance from the former spot to the line of the parieto-occipital

sion or excavation but by upheaval of cerebral substance, and this upheaval is less marked in the higher than in the lower Simiadæ, and in Hominidæ is usually entirely absent. As Gratiolet summed the matter up in his Mémoire sur les plis Cérébraux de l'homme et des Primatès, 1854, p. 97, 'Le lobe occipital atteint le maximum de son développement dans les Cynocephales. Beaucoup moins développé dans les Macaques il diminue de plus en plus en passant des Guenons aux Semnopithèques, et de ceux-ci aux Gibbons et aux Orangs-Ajoutons qu'il atteint son minimum dans l'espèce humaine.'

As variability in a structure or organ is justly considered to be some sort of an indication that it is tending towards becoming rudimentary, the variability of the occipital portions of the skull and of the brain attains some significance. Of this variability I have already spoken, p. 649 *supra*. Since writing as above, a human brain has been added to the series in the University Museum (No. 950 g and h), the occipital lobes in which are remarkable for the extreme scantiness of their fissures and convolutions, the very reverse, extreme complexity, to wit, and sinuosity, being usually found in this part of the human brain, at least in Europeans, and being very ordinarily stated to be characteristic of it. See for example Cruveilhier's Anatomie Descriptive, iii. 2. p. 454, ed. 4; Pansch, Abhandl. Naturwiss. Verein. Hamburg, Altona, 1876, p. 25; and Gratiolet's words applied to this lobe, 'Ses plis, d'une extrême irregularité, semblent devoir échapper à toute description' (Mémoire, 1854, p. 61).

Taking all these considerations together, that namely of the inferiority of the hydraulic character of the vascular supply of the occipital lobes, that of their histological inferiority, that of their lesser amenability to disease, a privilege which we do not find to be enjoyed by organs of great functional importance, and that finally of their great variability, and coupling them with a comparison of the homologous lobes in the Simiadæ, I am inclined to consider the occipital lobes proper of the human brain as being semi-rudimentary structures. A parallel case appears to me to be furnished by the history of the fourth (the azygos or post-caval) lobe of the right lung in the Primates. This small lobe retains its independent vascular and bronchial supply till we reach the higher Anthropomorpha; it is lost in them and in us.

fissure was 2″ on both sides. In the brain of a Malay (No. '950 i and j' in the Oxford University Museum), the skull belonging to which has not been accessible to me, but which may be supposed to have been brachy-cephalic, and from the measurements here given to have been sinistrally flattened (see p. 573 *supra*) in the parieto-occipital region, I find the width of this zone to be 0·95″ on the left and 1·7″ on the right side. In Negroes, who are usually spoken of as being 'occipitally dolicho-cephalic,' but in whom the position of the parietal tubera is more variable than in any other race of men with which I am acquainted, I have found the width of this zone vary correspondingly. In one Negro brain I found it to be 2″ on both sides; in the cast of another, presented by R. Garner, Esq., F.L.S., to the University Museum, I find the width to be 2·3″ on the right side and 1·9″ on the left; in another, in which the posterior cerebral arteries on both sides were very largely contributed to by the carotids and the convolutions generally broad and coarse, I found the width of this belt of brain to be 0·4″ on the right and 1·1″ on the left side. It is rarer to find great differences in the width of this zone in dolicho-cephalic than in brachy-cephalic brains, which indeed the most superficial examination of the skulls would lead us to expect would be the case.

When, however, we have gained the knowledge that particular sets of convolutions in the brain underlie particular areas of the surface of the skull, and correspond generally in extent and limits with them, we have gained after all but little unless we can go further and show that particular functions, or at least that a greater power for activity in functions generally, can be assigned to the portions of brain thus localised. To attain either of these ends we must enter upon the following lines of enquiry. We must ask, firstly, whether any portions of the brain-surface have such a differentially advantageous blood-supply as to render it but reasonable to suppose that they have either differentially important functions, or a differentially greater amount of functions generally, to undertake. Secondly, we must discover whether the microscopical structure and connections of the several convolutions can be shown to differ in such a way and to such an extent as to justify us in conjecturing that important differences of function, either qualitative or quantitative, must be correlated with such differences of structure. Thirdly, we may learn much from observations as to the sequence of certain mental upon certain cerebral changes produced either by disease or by accidents. Fourthly, the comparison

of the brains of human beings of various known capabilities and ages with each other and with the brains of the lower animals which are nearest to man casts a diffused, if not a concentrated light upon the entire enquiry. Arguments bearing upon this question may be procurable from other sources; of the four specified the first furnishes us with the least ambiguous and the most readily verifiable indications; with these the indications furnished by the other three, if not connected in the way of effect with cause, are at all events correlated in the way of concomitant growth.

A survey of the distribution of the several arteries[1] supplying the cerebrum appears to show unmistakably that the particular zone of convolutions in question is at unmistakable disadvantage in the matter of irrigation as compared with the segments of the hemisphere which lie in front of it, and that of two brains of equal or approximately equal length that one is the more favourably conditioned which has this segment contributing the smaller factor towards making up its total length.

The belt of convolutions which interposes itself between the line of the lambdoid suture and another line drawn parallel to either half of that suture over the parietal tuberosity of that side receives its main arterial supply from the terminal twigs of that branch of the internal carotid which is known in this country as the 'middle cerebral' artery, but which for the present purpose might bear one of its foreign names, viz. '*arteria fossæ Sylvii.*' For it is only after having supplied the very numerous and extensive convolutions which form the floor and the walls and the margins of this great *fossa* that terminal branches of this artery emerge on to the exterior convex surface of the brain and distribute themselves to this zone of the hemisphere. In following up the distribution of the two terminal branches of the carotid we are impressed with the differentially favourable condition as regards vascular irrigation of

[1] Some difference of opinion exists between the two investigators, MM. Duret and Heubner, who have (Archives de Physiologie Normale, 1874, tom. vi., and Centralblatt für die Med. Wiss., 1872, Die luetische Erkrankung der Hirnarterien, 1874, pp. 172-175) been investigating the cerebral circulation, as to the degree of freedom with which the arteries in question anastomose with each other. Heubner however, who specially insists upon the formation in the pia mater of a common retiform reservoir by all the brain-supplying arteries in a common solidarity, nevertheless allows, as the facts of pathological embolism even more than those of experimental injection compel him, that the different parts of this reticulation are filled from the different main arteries with differing facility; '*von dem entfernterem naturlich schwerer und langsamer als von dem naheren.*' This is all that need be asked for justifying the argument in the text.

the lower parts of the frontal lobes which receive supplies of blood from the anterior cerebral as well as from the middle cerebral arteries; the deep fissure of Rolando, though the convolutions bounding it may not be quite so advantageously supplied as the horizontal convolutions just spoken of, has nevertheless a double supply both from the middle and from the anterior cerebral artery; but it is from the middle cerebral artery alone that the area immediately posterior to and on the same level with the supra-marginal convolution, and this convolution itself, are supplied. When we consider the length and the direction relatively to the carotid of the fissure of Sylvius, the extent of the area to be supplied within it, and the tortuosities necessarily described by an artery passing along it to emerge on to the convex surface of the brain, in the words of Duret, *l. c.*, the '*pli très accusé dans le sillon profond qui sépare le lobule de l'insula de la circonvolution marginale;*' it is obvious to us that the current of the blood in the terminal arterial twigs supplying the part of the brain in question must be considerably slower than that in any portion of the brain situated anteriorly to it. This would be the case even with a system of tubes which were neither contractile nor elastic; that these properties of the arteries supplying this part of the brain may count for much is sometimes rendered strikingly plain to us by their embedding themselves in the substances of the cerebral cortex of brains preserved in chloride of zinc and alcohol. Several authors[1] have remarked upon the great variability of the cerebral convolutions in the area of which we are treating; there are several reasons however for hesitation as to referring this variability of the topographical disposition of the vesicular neurine to the less vigorous character of the circulation of the blood in the arteries supplying it: but if this peculiarity does not explain the greater morpho-

[1] Bischoff, Die Grosshirn Windungen des Menschen, Abhandl. bayer. Akad. der Wiss., cl. ii. bd. x. abth. ii. p. 432, S.A. 42; Ecker, The Convolutions of the Human Brain, English translation by J. C. Galton, p. 33. In support of the view that great differences in functional activity may depend upon hydraulic differences such as those described in the text I may refer to the now usually accepted explanation of the phenomenon of right-handedness, to wit, the advantage which the left side of the brain obtains in the matter of irrigation by virtue of the origin of its carotid directly from the arch of the aorta. I take this opportunity of observing that the right cerebral hemisphere is very frequently put at a second disadvantage by the fact that the basilar artery gives it scarcely any supply at all, but distributes itself almost wholly to the left, leaving the carotid to give off the posterior cerebral artery of the opposite side. This arrangement I had noted previously to becoming acquainted with M. Duret's mention of it (Archiv. de Phys, 1874, p. 68). He does not connect it however with the hydraulic explanation of right-handedness.

logical variability of these convolutions, it does justify us in ascribing to them a lesser physiological activity.

Leaving now the consideration of the distribution of arteries over this particular area of the cerebral cortex as detectible by the naked eye, we come to a consideration of the histological characters of this zone as compared with that of the fronto-parietal convolutions which lie anteriorly to it. And it is a fact of cardinal importance that it is in this anteriorly situated part of the brain that the large pyramidal cells, the '*cornu ammonis* formation' of Meynert, so characteristic of the healthy human brain, are chiefly, if not exclusively, found. The largest indeed of these pyramidal cells, 'Riesenpyramiden,' have been said by Professor Betz to be limited in their distribution posteriorly by the line of the fissure of Rolando (see Centralblatt. Med. Wiss. 1874), and Dr. Achille Foville (Medical Examiner, Feb. 1, 1877, p. 85) does but extend the area in which they are all but exclusively to be found, just so much further back as is the second ascending central convolution which forms the posterior boundary of that fissure. Dr. Major (Journal of Mental Science, Jan. 1876) has justly insisted upon the indications with which human pathology firstly, as shown by him in the West Riding Asylum Reports, 1872, vol. ii. pp. 41–52, and comparative anatomy secondly, furnish us as to the functional importance of these pyramidal cells; it being in these cells that 'degenerative changes first occur when age is beginning to do its work and *pari passu* the intellect is failing,' whilst 'as we proceed downwards in the scale of development it is these cells which vary most distinctly from the corresponding bodies in the human organ.' To this I would add that the histological characters of these cells when compared with those of other cells known to discharge important functions with great activity are such as to vindicate their claim to a high rank amongst such cells. As seen in a microscopic specimen prepared by the ordinary reagents, these cells are remarkable, firstly, for their large size; then for their freedom from the limitation of a cell wall; thirdly for the clear lacunar spaces in which they lie; fourthly, for their angular nucleolated nucleus prolonged at its angles into processes somewhat like those of the cell itself; fifthly, for these processes themselves, apical, basal, and lateral. Those who are impressed with the value of the hypothesis put forward by the late Professor Parkes[1] to the effect that in a

[1] Proceedings of the Royal Society, June 20, 1867, xvi. 94. Dr. Parkes having discovered that though active exercise produced no *immediate* increase in the elimina-

living body activity of function entails certain processes of growth, whilst in rest the temporarily enlarged organ returns slowly to its normal size, will be inclined to consider the clear lacunar space which surrounds these large cells as eminently significant of their activity as allowing room for increase of their dimensions. Nor will any dispute as to whether these lacunar spaces are *arte facta* due to action of hardening and contracting reagents or natural, whether lymphatic or non-lymphatic, spaces affect this view. For the contraction which, on the former of these views, the cell undergoes in histological preparation may be very well taken as reproducing after death a similar contraction which, *ex hypothesi*, would accompany rest and abeyance of function in life.

Coming in the third place to a consideration of the evidence which processes of disease or other injury may give us for the conclusion that the parts of the brain anterior to the plane of the parietal tubera are more active and important in function than those situated posteriorly to it, I would refer the reader to the instructive Plates iii–viii given by Dr. J. Crichton Browne in his most valuable paper, already referred to, in the West Riding Asylum Reports, vol. vi. 1876, on the pathology of the general paralysis of the insane. In those plates a number of brains from such patients are figured, and so coloured as to indicate the regions of the brain upon which the stress of the disease has fallen. *There is in these plates scarcely an instance in which a single patch of colour is given on a spot situated posteriorly to the fissure of Rolando.* And I submit that as it is but reasonable to suppose that the parts of any organ which are found to be the most liable to suffer from irritation, inflammation, and other morbid action are so because normally they are the seats of habitual activity, this distribution of the signs of disease over the area in question is of cardinal significance.

In the last place, I will mention very briefly the indications which the comparative anatomy of some of the various races of mankind, and of the developing skull and brain in the human species, as also the proportion of two segments of the parietal bone anterior and posterior to the line of the primitive centre of ossification, furnish to us in this investigation.

tion of nitrogen, such increase did nevertheless take place when a certain interval had elapsed after such exercise, explained (p. 55, *l. c.*) this succession of phenomena by suggesting that 'during action a muscle takes nitrogen and during rest gives it off,' or that, 'in other words, the action of a muscle would seem from these experiments not to be connected with disintegration but with formation; when it is in exercise the muscle increases, when it is quiescent it lessens in bulk.'

The most typically dolicho-cephalic modern race, not even excluding the Esquimaux, is beyond doubt the Australian. As was pointed out long ago in the Osteological Catalogue of the Royal College of Surgeons, vol. ii. p. 838, No. 5385, brachy-cephalic skulls are to be found amongst Negro tribes, and (see p. 670 *supra*) instances may be found among Negro brains of excessive narrowness in the zone of brain between the supra-marginal and the occipital convolutions, though some of the most forwardly placed parietal tubera which I have ever met with are from series of Caffre crania; and though, secondly, these tubera are sometimes backwardly placed even in dolicho-cephalic Negro heads. Confining ourselves therefore to the consideration of the Australian cranium, which furnishes us with a simple case, as its uniformity and also the degraded character of the race are alike beyond dispute, we have to say that the parietal eminences all but always occupy a relatively forward position in the parietal bone and in the skull of the Australians; and that to the unvarying dolicho-cephaly of their brain the segments lying posteriorly to the plane of the 'lobulus tuberis' always contribute a quantitatively large though not a qualitatively superior proportion. Without going further into the controversy alluded to at pp. 646–647 *supra*, as to the relative superiority of the dolicho-cephalic or brachy-cephalic type, it may suffice to say here that not only would the inferiorly irrigated and histologically inferior segments of the modern European dolicho-cephali found in Germany, England, and Ireland form a smaller proportion of the entire length of their brains than, judging from their skulls or from such casts as those labelled 6 and 7 in the Museum of the College of Surgeons, the homologous segments do in the Australian brain, but that the anterior segments of the European brain are broader, with their fissures therefore deeper, and their aggregate square area of grey matter much more extensive than those of the Australian brain; the Europeans specified being *dolicho-cephali latiores*, and the Australians *dolicho-cephali angustiores*. But the dolicho-cephalic 'Silurian' type which characterised the inhabitants of Great Britain and Ireland, and of a very great part of Europe also, in the stone age, included crania resembling the Australian in the points of which we are speaking, for the long-barrow-builders were not rarely 'dolicho-cephali angustiores[1].'

[1] If Schröder van der Kolk's calculation as to the extent of that difficultly measurable area made up by the surface of the convolutions within and without the fissures from the fissure of Rolando to the front of the brain in men of various degrees of

The argument from the history of the growth of the skull which comes under this head cannot be given better than in the following words of Gratiolet (Bull. Soc. Anthrop. Paris, tom. ii. Avril 18, 1861, p. 253): 'Chez l'enfant nouveau né le centre du point primitif d'ossification du pariétal est plus distant de l'extremité occipitale du crane que de son extremité frontale. Le cas inverse est realisé dans l'adulte. On deduit de ces faits une conséquence rigoreuse savoir que dans le passage de l'enfance à l'âge adulte les parties antérieures du cerveau s'accroissent plus rapidement que les parties postérieures. Cet accroissement marche d'arrière en avant de l'occipital au frontal, il se propage comme une ondulation d'une vertèbre à l'autre.'

The maintenance therefore by the part of the parietal posterior to its tuberosity, a part representing its primitive centre, of a pro-

intelligence had been accepted and confirmed by other anatomists, another argument would have been available under this head. According to these calculations (Pathology and Therapeutics of Mental Diseases; Australian translation by J. T. Rudall, 1869, preface, p. vi), based upon measurements of the figures given by Rudolph Wagner in the first part of his 'Vorstudien zu einer wissenschaftlichen Morphologie und Physiologie des Menschlichen Gehirns als Seelenorgan,' 1860, the 'lobus anterior before the gyrus centralis' held to the 'lobus anterior behind the gyrus' the relation,

in the mathematician Gauss	. .	of 88·5	: 100.
in the mathematician Lejeune Dirichlet		of 100	: 100.
in the philologist Hermann	. .	of 75	: 100.
in the artisan Krebs	. . . .	of 69	: 100.

Schröder van der Kolk in writing to this effect, Nov. 21, 1861, to Dr. Theile of Weimar, *l. c.*, remarks that 'it will be understood that this gives only a relative value and a relative accuracy, for I measure the plane and not the arched surface, but after all that occurs in a tolerably equal degree in all the measured brains. I am convinced it would lead to good results if comparisons were made in this way between the brains of persons of talent and those of less mental capacity.' But Rudolph Wagner, to whom the actual brains were available, whilst Schröder van der Kolk's estimate was based merely upon Wagner's figures of them given in his 'Vorstudien' of 1862, repudiated (Vorstudien, 1862, ii. p. 21) the Dutch anatomist's conclusions. And Hermann Wagner, following up mathematically his father's researches in his 'Maasbestimmungen der Oberfläche des grossen Gehirns,' 1864, p. 36, averred that the only difference which his more exact method of measurement, as applied to the difficultly measureable area in question, in four brains examined by him, including those of Gauss and Krebs, had enabled him to discover was that with the increase of intelligence the complexity of the convolutions increased in the frontal, but not demonstrably in the other lobes of the brain: 'Eine Bevorzugen eines einzelnen Lappens und zwar des Stirnlappens gegenüber dem ganzen Gehirns hat sich für die intelligenten Gehirne aber doch durch diese Messungen herausgestellt; die Oberfläche des Stirnlappens derselben besetzt eine starkere Zerkfluftung als die übrigen Lappen.' It is obvious, I may remark, that any argument which could be based upon mere mensuration of the square area made up by the convolutionary sheet of gray matter in various segments of the brain would be more amenable than any of the lines of argument given in the text to objections on the ground that such measurements took no account of possible variations in the thickness firstly, and in the quality secondly, of the sheet of gray matter.

portion at all approaching equality with the part anterior to it is a retention of infantile proportions, and *pro tanto* a sign of inferiority.

Mutatis mutandis a comparison of the skulls of the anthropomorpha leads us to a similar conclusion. In those apes though the lobule of the marginal convolution and the parietal eminence corresponding to it are only faintly marked; and, though the Asiatic Orang is often less dolicho-cephalous than its African allies; still the primitive centre of ossification of the parietal bone which may be supposed to hold the same relation to the subjacent brain which the homologous area in the human skull is wont to do, divides the bone, in all of these Simiadæ, into two much more nearly equal segments than is usually the case in the adult human subject.

Thus from the four points of view furnished by considering their irrigation, their histological structure, their relative activity as indicated by their greater amenability to the incidence of disease, and their comparative anatomy, the anterior parts of the brain of which we have been treating can be shown to be superior in importance to those which lie posteriorly to them. The convolutions which are curtailed in the posterior part of a brain with its anterior segments relatively large are those which underlie that zone of the skull which is interposed between parallel lines drawn over the parietal tuberosity and over the line of the lambdoid suture. Hence the importance of the two craniographical peculiarities, viz. the posterior position of the parietal tubera (p. 637 *supra*) and the vertical dip of the posterior half of the bone (p. 638 *supra ibique citata*) so characteristic of the brachy-cephalic skull, and so clearly indicative of a brain, *pro tanto* and *ceteris paribus*, favourably conditioned and advantageously constituted. And the *rationale* of a third craniographical distinction, that, namely, which is given in the 'Antero-posterior Index' (p. 563 *supra*), lies in its furnishing us with a more or less exact numerical expression of the relative extent of the more favourably conditioned segments of such brains. The average antero-posterior index of the dolicho-cephalic skull as obtained from the measurements, given with the descriptions, of the small number of 'Silurian' skulls figured in this book, is 47 as against 52 for the average of the brachy-cephalic 'Cimbric' skulls, also figured here; and this disadvantageous proportion is only reduced by a fraction amounting to $\frac{1}{6}$ when we compare the average obtained from six other prehistoric Silurian

skulls not figured in this book with the average obtained from six other brachy-cephalic skulls taken from Swiss, English, and Tamil series. These figures may be taken as being strongly confirmatory of the other evidence for the inferiority of the Silurian dolicho-cephalic to the Cimbric brachy-cephalic race which is furnished by several other physical peculiarities (see p. 641 *seqq. supra* and p. 680 *infra*), as well as by the historical or rather prehistorical fact of its having been conquered and in some parts of this country displaced and replaced by the later stock.

To obtain, however, a complete idea of the characteristics of a people, it is necessary not only to know what their stature and what the proportions of their skull measurements may have been, both in themselves and in relation to the brain-segments they covered; but to be able to reproduce to our view their complexion and the colour of their eyes. These latter points indeed, of which the barrows can tell us nothing, are to the ordinary traveller an enquiry at least as interesting as even the stature, and though it is possible to overrate their value and importance to the ethnologist, at all events when he is dealing with races as capable of complete fusion as those whose remains we are here concerned with, they still possess, even for him, an interest which is little inferior to that of the less perishable remains.

In Europe at the present day we have the following combinations of complexion and stature and cranial indices. We have, firstly, in certain parts of Great Britain and of Germany light hair and complexion combined with considerable stature and with dolicho-cephaly, so as to preserve for us what excavations, combined with measurements and with traditions, justify us very entirely in speaking of as the Teutonic or Germanic type[1]. Secondly, we have the same hair, complexion, and stature combined with brachy-cephaly in the Finns[2], in the Danes[3], in some Sclavs, and in many of not the least vigorous of our own countrymen. Thirdly, hair, complexion, and stature, all alike of just the opposite character, may be found combined with brachy-cephaly in South Germany, and in some other parts of the Continent, as,

[1] See Hölder, Archiv für Anthrop. ii. p. 51; v. p. 538; Zusammenstellung der in Wurttemberg vorkommenden Schädelformen, 1876, p. 6; and Cleland, Phil. Trans. 1870, p. 148.

[2] Virchow, Beiträge zur physischen Anthropologie des Deutschen 1876, pp. 9, 10; Zeitschrift für Ethnologie, iv. 380, v. 320; Archiv für Anthropologie, iii. 553–555, iv. 78.

[3] Dr. Beddoe, Mem. Soc. Anth. Lond. vol. iii. p. 382.

for example, Brittany[1]. Fourthly, and as regards the earlier of the two prehistoric races with which we are dealing, most importantly, we have in this country dolicho-cephaly combined with low stature and with dark complexion in a very considerable number of our population, even in districts such as the Midland Counties, where the names of the towns and villages show that the Saxon and Danish conquerors occupied it in for the time entirely overwhelming numbers. The fact of the existence of this stock, or, we may perhaps say, of its survival and its re-assertion of its own distinctive character in the districts of Derby, Stamford, Leicester, and Loughborough, was pointed out in the year 1848 by the late Professor Phillips, at a meeting of the British Association at Swansea (See Report, p. 99). More extended observations, but to the same effect, are put on record by Dr. Beddoe (Mem. Soc. Anth. London, ii. p. 350) in the following words: 'Of twenty-five Englishmen having black or brownish-black hair, the average index of head-breadth is so small as 76·5, which is the lowest I have met with in any set of men. Eight Welshmen having black hair yielded the same modulus to a

[1] Hölder, Zusammenstellung, p. 6, says, 'Aus dieser Zusammenstellung geht nun mit Sicherheit hervor dass Haare und Augen um so heller werdem je naher der Index des Germanischen Typus kömmt, und desto dunkler je brachycephaler der Schädel ist. Blaue und graue Augen und blonde oder hellbraune Haare so wohl hier als in Waiblingen häufiger mit hoher Statur vorkommen als dunkle Augen und Haare. Der Hauptmasse der letzteren fällt nämlich auf die grossen Classe von 166-176 cm. (=65·35″–69·29″); Zwischen 176 und 182 cm. (=69·29″–71·6″) fanden sich nur blaue und graue Augen und der grosste von ihnem mit 182 cm. war blond und blauaugig.' Ecker (Archiv für Anthropologie, ix. 1877, p. 259) says, writing from Freiburg im Breisgau, 'Die in unserem Lande einst so verbreitete Schädelform der Reihengräber die wohl unzweifelhaft auch mit einer bestimmtere Körperstatur verbunden war, jetzt fast ganz einer anderen Form Platz gemacht hat deren Träger in ihrem ganzem physischer Habitus anders geartet sind als jene es wahrscheinlich waren. Waren jene hoch gewachsen vorherrschend blond so sind diese gedrungener dunkler vom Haar und Augen.' Of the Bretons, Dr. Beddoe (Memoirs Lond. Anth. Society, iii. p. 362) says they are of low stature, being remarkable for this even among the French, that in about three-fourths of the people the hair is very dark, and is about one-fourth coal-black, and that the head is, as Broca had pointed out, short and broad, with the exception of the Léonois district. Broca, writing of Bretons (see Mem. Soc. Anth. Paris, i. 1859, or Mémoires d'Anthropologie, i. p. 297; and Bull. Soc. Anth. Paris, Ser. ii. tom. viii. p. 313, Avril 1873), contrasts the Celtes *s.* Armoricains, being petits, bruns, brachy-cephales, with the peuples Belges *s.* Kymrys, who are grands, blonds, dolicho-cephales. Sir Henry Dryden, Bart., writes to me of the Bretons to the following effect:—'As compared with the English the whole race are brachy-cephalic, but the Breton peasantry much less so than the middle class. The Bretons are taller than the other French. I noticed in the regiments many very short small men, and I think almost all the swarthy men were small. Many were very swarthy. Many of the middle class not Bretons are ludicrously brachy-cephalic, and their necks often thicker than most English besides.'

fraction as thirty-eight who had hair of other colours, though I must concede that eight black-haired Kerrymen had heads broader by ½ per cent. than twenty-four others. The observations of my friend Mr. Hector Maclean on the islanders of Islay and Colonsay bear me out on this point very strongly, his black-haired men, twenty in number, yielding a modulus of seventy-six, or 3 per cent. less than that of their lighter-haired neighbours. *Mr. Maclean's measurements and my own both indicate that a notable, though not very great inferiority in stature and bulk, does, on the average, characterise the black-haired type.*'

The tall powerfully-made brachy-cephalous Briton of the round-barrow period all but certainly presented much the same combination of physical peculiarities as the modern Finn and Dane, whilst of the feebler folk of the long-barrow times we may say with nearly equal probability that they possessed, like the modern English, Irish, Scotch, and Italian of similarly low stature, the *colorati vultus* ascribed by Tacitus to the Silures, and supposed by him to furnish some ground for connecting them with the Spanish. The indications in favour of these views are as follows. The bronze-period Briton very closely resembles in his osteological remains the brachy-cephalous Dane of the neolithic period, and the likeness between these and some of the modern Danes has been noticed by Virchow in his valuable Memoir on Die altnordischen Schädel zu Kopenhagen Arch. für Anth. iv. p. 71, 1870. There are not wanting, as already pointed out, p. 631 *supra*, reasons for supposing that the brachy-cephalic people of the round-barrow period may have immigrated into this country from the Cimbric Peninsula[1], that, in other words, the historical invasions of Cnut and Swegen

[1] Of the modern Danes we know from Dr. Beddoe's paper in the Memoirs of the Anthropological Society, vol. iii. p. 382, that with the cephalic index of 80·5 they combine a stature of 5′ 6·9″, which would be a fair average for Great Britain, eyes which are almost always light and either blue or bluish-grey, and hair which is generally either pale yellow or light brown. It would be interesting to know whether in the exceptional cases, in which the hair is black, as in the Moen man of whom Dr. Beddoe writes, the colour was not light in infancy; this change being one which is often observable amongst us now, as indeed it was among the Gauls in the time of Strabo and Diodorus Siculus (and, as Mr. A. J. Evans informs me, among both the Finns and the Lapps), and being one which, upon the principles of modern zoology, should be taken to indicate that the parent stock was originally light-haired permanently. The words of Diodorus Siculus (v. 32) are—*τὰ παιδία παρὰ τοῖς Γαλάταις ἐκ γενετῆς ὑπάρχει πολιὰ κατὰ τὸ πλεῖστον· προβαίνοντες δὲ ταῖς ἡλικίαις εἰς τὸ τῶν πατέρων χρῶμα ταῖς χροαῖς μετασχηματίζονται.* I should doubt, even as to the earlier race, whether Jornandes, when he, in the words of Lipsius, *adspexit imo transcripsit* the chapter xi. of Tacitus' Agricola relating to the Silures, had any real reason for substituting '*torto plerique crine et nigro nascuntur*' for the exact words of the great historian.

may have been but repetitions of prehistoric invasions of the bronze period, of, in other words, earlier 'Wikingzüge.' This being so, it becomes of consequence to recollect that though the ancients, the contemporaries of the Cimbric invaders, differ as to speaking of them as 'Gauls' or 'Germans,' they are unanimous as to describing them as light-haired and blue-eyed, as well as tall of stature, in comparison at least with the Italian population, Horace's line, 'Nec fera cærulea domuit Germania pube' (Epod. xvi. 7), being supported by parallel[1] passages nearly infinite in multitude.

I have already remarked, pp. 628–629 *supra*, that intermediate forms, belonging distinctively to neither the one nor the other of the two great types of dolicho-cephaly or brachy-cephaly, are not common in these series. In the skulls of the stone age in Great Britain we find no unambiguous traces at all of any admixture with the brachy-cephalic type; and even amongst skulls from barrows of the bronze age, when the two races were living and dying together, it is rare to find skulls which combine, as the 'Mischformen' of the German anthropologists do, the contour and picturesque peculiarities of the one type with the proportions and measurements of the other. Still such forms are to be found, and there are two principal varieties of skull from the later period, the existence of which it is perhaps better explained by the hypothesis of their being the result of intercrossing than in any other way. And, firstly, I should be inclined to consider the very large size[2] of certain crania of the bronze period as due to an

[1] For these see Ukert's Germania, pp. 198, 199, 345, 347, 348, 353, 362; Zeuss, Die Deutschen, p. 51; Perier, Fragments Ethnologiques, pp. 43-82; Prichard, Physical History, iii. 3rd ed. 1841, pp. 189–200. The Chevalier Bunsen is referred to by Prichard as saying that he had 'often looked in vain for the auburn or golden locks and the light cærulean eyes of the old Germans, and never verified the picture given by the ancients of his countrymen till he visited Scandinavia, and that there he found himself surrounded with the Germans of Tacitus.' Exact investigation has however recently shown (see Virchow, p. 11, Beiträge zur physischen Anthropologie der Deutschen, 1876, Berlin Abhandlungen) that the physical characteristics of light hair, blue eyes, light skin, so constantly spoken of by the ancient writers, make up still no less than 35·47 per cent. of the children at school in Prussia, though the proportion falls to 20·36 per cent. in Bavaria, brunettes being in this latter country 21·09 per cent. against 11·63 in Prussia.

[2] Without extending our view to the lower animals, it is easy to convince ourselves that a great increase of size is very often at the present day a result of the intercrossing of two varieties of our own species. V. Baer, on the occasion of the famous meeting of anthropologists at Göttingen in 1861 (see Zusammenkunft einiger Anthropologen, p. 22), drew attention to the increase of vigour which Baron Osten Sacken had observed amongst North American half-breeds; and Professor Daniel Wilson, in his Memoirs on Hybridity, p. 27, 1875, writes with great particularity to

intercrossing of the two stocks. Such skulls are all found in barrows of the later period, and all, while retaining both the contour and the proportions of the brachy-cephalic type, still exceed the great majority of such skulls in the matter of cubical capacity. His and Rütimeyer consider the largest of the skulls treated of by them in their Crania Helvetica (p. 44), skulls to wit with an average capacity of 1638 cc. = *circa* 100 cub. in., a maximum of 1820 cc. = *circa* 111 cub. in., and a minimum of 1430 cc. = 87·27 cub. in., to be the result of the intercrossing of their 'Sion typus,' which is the skull of the 'Pfahlbauten' and (p. 34) 'unserer Keltischer Vorfahren' and corresponds to many of our long-barrow skulls, with their 'Disentis Typus,' which corresponds to many of our round-barrow skulls. It is of great importance to note this coincidence as to the facts observable in Switzerland and in Great Britain respectively.

A second variety of skull, which I incline to consider a 'Misch-form,' is found in round barrows containing both dolicho-cephalic and brachy-cephalic crania, lying together peacefully and in equally honourable positions within their precincts. These skulls differ from those just spoken of in being dolicho-cephalic by measurement, but they resemble them in combining with this proportion of breadth to length the precipitous dip downwards of the posterior half of the parietals which is so characteristic of brachy-cephaly generally,

the same effect in the following words: 'The Half-breeds are a large and robust race, with greater powers of endurance than the native Indian. Mr. S. J. Dawson, of the Red River Exploring Expedition, speaks of the French Half-breeds as a gigantic race as compared with the French Canadians of Lower Canada. Professor Hind refers in equally strong language to their great physical powers and vigorous muscular development; and the venerable Archdeacon Hunter, of Red River, replies in answer to my inquiry, "In what respects do the Half-breed Indians differ from the pure Indians as to habits of life, courage, strength, increase of numbers, &c.?" "They are superior in every respect, both mentally and physically." Much concurrent evidence points to the fact that the families descended from mixed parentage are larger than those of the whites; and though the results are in some degree counteracted by a tendency to consumption, yet it does not amount to such a source of diminution on the whole as to interfere with their steady numerical increase.' Similarly, Mr. Huth (Marriage of near Kin, 1875) writes, p. 308, that 'crosses are beneficial in very often effecting an increase of size in the progeny, exceeding that of either parent, is established beyond doubt.' pp. 324 and 325. 'The Zamboes, or offspring of Negroes and American Indians, are, according to Dr. Hancock, remarkable for their physical superiority over their progenitors on either side, and this he says is a well-known fact.' *Per contra*, 'Most of the criminals of Nicaragua are, according to Squier, Zamboes, bigger and better made than their parents, without possessing any of their good qualities.' Dr. Beddoe's investigations into the stature and bulk of man in the British Islands (Mem. Anth. Soc. iii. 553) have led him to say, 'on the whole, the results of my tables tend to support, but only in a feeble way, the current opinion as to the advantageous effect of crossing upon size.' Professor Broca (Mémoires, i. p. 342) says, 'L'amélioration des races par des croisement est fortement contestée aujourdhui;' but he should have added, I think, words limiting the dispute to France.

and the great height which is so characteristic of the brachycephaly of prehistoric times. A skull figured by Dr. Ad. Pansch (Arch. für Anth. vi. 3, p. 175, 1873) as found in a deposit cut into in the excavations for the new harbour at Kiel and in surroundings which, without definitely proving the skull to have belonged to the stone age (pp. 174, 179), did yet vindicate for it claims to a very considerable antiquity, gives a very good representation of this form of skull. Another may be found in the ancient British skull from a barrow at Kennet, near Abury, North Wilts, figured and described in the Crania Britannica, Pl. 11, by Dr. Thurnam. Some additional probability for the view which would consider these skulls to be 'Mischformen' is on the principle laid down in note 3, p. 636 *supra*, gained from the fact that this latter skull had belonged to a skeleton with a thigh of 20·5″, and by consequence to a man of not less than 6′ 2″ in stature. Neither of the authors touch upon this point in treating of these skulls; they coincide with each other in observing upon the great height and the vertical dip of the posterior part of their parietals. As regards the series of prehistoric crania with which I am dealing, I have to say that whilst skulls of this kind are by no means rare in interments of the bronze period (e.g. 'Flixton, lxxi. 12,' p. 278; 'Jarrett, civ.' p. 315; 'Sherburn Wold Prodham, ix. 1;' 'Paulinus, cxiii. 3,' p. 322), they form a considerable proportion of the skulls from Canon Greenwell's series of the late Keltic or early iron age of Great Britain, and are entirely wanting, so far as I have observed, in the series from the long barrows. The skull from Grimthorpe in the East Riding of Yorkshire, described in the Proceedings of the Society of Antiquaries, March 18, 1869, by Dr. Barnard Davis, and now in the Oxford University Museum; the skull from Arras in the same locality, figured and described by Dr. Thurnam in the Crania Britannica, Pl. 6; and a skull from Crosby Garrett (see p. 386 *supra*) in the county of Westmoreland, may be mentioned as combining the peculiarities above spoken of with the archæological surroundings of the comparatively short period between probably, at the utmost, 200 B.C. and 100 A.D. Mere etymology might lead a reader to suppose these lofty yet dolichocephalic skulls might resemble the 'Hypsisteno-cephali' of the Melanesian islands described by Dr. Barnard Davis (*locc. citt. supra*, p. 650), they differ however from these skulls in being larger in cubical contents; in being better filled out, especially in the frontal region; in being orthognathous; and above all, in having their parietal tubera far more backwardly placed. See p. 454 *supra*.

I will now pass from the consideration of the skulls as found in a more or less perfect condition, or at least in one which has admitted of their being, partially at least, restored, to a consideration of certain conclusions which have been based upon the appearances presented by the fragments into which the prehistoric skulls are, so often and so unfortunately, found to be broken.

Dr. Thurnam has in several memoirs [1] argued from the appearances presented by the breakages observable in the skulls from long barrows to the existence of the practice of human sacrifice upon the occasion of the interment of the chiefs in the stone age. We have a large mass of literary evidence in favour of the continuation of this practice into historical times amongst the Gauls and other foreign races with whom the Romans and Greeks came into contact. The story of the funeral of Patroclus preserves for

[1] As regards the literature of the supposed discovery of skulls cleft *ante mortem*, the following references may be given:—

Mr. Cunnington in 1801 (Ancient Wilts, Sir R. C. Hoare, i. 87, *cit.* Thurnam, Archæologia, xxxviii. p. 420) found in a long barrow near Heytesbury, called Bowl's Barrow, a number of skeletons crowded together at the east end, the skull of one of which appeared to have been cut in two by a sword.

Sir R. C. Hoare writing in 1817, Archæologia, xix. p. 48, says, 'Only one or two instances have occurred where we have found any defect or pressure on the skull, indicating a mortal wound: but in one of the barrows near Stonehenge, we dug up a skull which appeared to have been cut in two by some very sharp instrument, and as nicely as any instrument of Savigny could have effected. This skull was reinterred in the same barrow.' A Round Barrow, Tumulus 36, Ancient Wilts, p. 163.

Dr. Thurnam, writing in 1855 in the Crania Britannica, pl. 24, Littleton Drew, says (p. 3) of the fragments of a skull, that 'the fractured edges were very sharp, suggesting the idea of having been cleft during life.' Writing in the Archæologia, xxxviii. 1860, of the long barrow at West Kennet, Wiltshire, Dr. Thurnam dwelt at greater length upon this subject, saying that the occurrence of such cleft skulls was curious and had 'an important bearing on the estimate to be formed of the general grade of civilisation of those who must be regarded as our remote ancestors.' His views were still further developed in the Memoirs of the London Anthropological Society, 1865, as also in the Journal of the Archæological Institute of the same year, vol. xxii. p. 107, in which he describes the appearances presented by the Ebberston skulls now in the Museum of this University. In the Crania Britannica, pl. 59, Dr. Thurnam, in his account of the skulls from the chambered long barrow at Rodmarton in Gloucestershire, examined by Canon Lysons in 1863 (see Proc. Soc. Ant., N. S. ii. p. 275, or his work, 'Our British Ancestors,' p. 137, 1865), describes and figures from that barrow a skull now in this Museum as an example of a skull cleft *ante mortem*; remarking (p. 4, note) that another of these supposed cleft skulls, from West Kennet, was like the Rodmarton specimen in having the frontal suture open, whilst the uninjured skulls were of a considerably more elongate type. Finally, in the Archæologia for 1869, vol. 42, pp. 185–188, we have the evidence as to human sacrifices restated with many references, and we have also appended to it the allied subject of anthropophagism; at p. 227 we have the Rodmarton skull, now before me as I write, figured; and the author states that the chambered barrows of Nympsfield and Charlton Abbots are the only instances of such barrows examined by him in which traces of violent cleavage of cranial bones had not been found.

us a tradition of its existence amongst the Greeks themselves; and from Virgil's allusions (Æneid, x. 518–520, xi. 81, 82) and Tertullian's suggestion (De Spectaculis, xii) as to the origination of gladiatorial shows from the sacrificing of men at funerals, we know that the Italian races were at one time guilty of the same cruelty. 'Necdum ea ætate,' says Heyne, Virg. *l. c.*, 'metuendum fuit Maroni ne displiceret immane facinus lectoribus,' such sacrifices having been abolished, as Pliny (H. N. xxx. 3. 4) tells us, by the Romans, only in the year 97 B.C. Still, in spite of these familiar and a cloud of other testimonies[1] of the literary kind in favour

[1] As regards the literature of immolation at funerals, the following references may be given in addition to those given in the text:—

Herod. iv. 71, the words in which, *ἔπειτα ῥαψὶ καταστεγάζουσι· ἐν δὲ τῇ λοιπῇ εὐρυχωρίῃ τῆς θήκης, τῶν παλλακέων τε μίαν ἀποπνίξαντες θάπτουσι, κ.τ.λ.*, find a detailed illustration in Mr. Joseph Anderson's translation of Professor Holmboe's Danish version of the Arabic account by Ahmed Fozlan of the cremation of a Norse chief, Proc. Soc. Ant. Scot., May 13, 1872, especially p. 525. Dr. Joseph Anderson, *l. c.* p. 522, refers to the Volsunga Saga as giving an account of the erection of a tent by Brynhild Gunnar over the pile on which she was to be burnt with Sigurd's corpse. J. C. F. Baehr, vol. iv. p. 560 of his 1832 edition of Herodotus, supplies the following references from Clarke's Travels in illustration of the account given by Herodotus of the funeral of a Scythian chief: i. pp. 32, 38, 199, 316, 338 coll., 354, 399, 432 *seqq.* I have not been able to verify these references, and they are omitted in Baehr's later edition, *l. c.* I owe to him however many of the following references bearing principally upon the practice of widow-immolation:—

Hdt. v. 5.
Cicero, Tusc. Disp. v. 27.
Diodorus Siculus, xvii. 91, and xix. 33, 34.
Strabo, xv. 1. 30. 699; xv. 1. 62. 714.
Propertius, iv. 12-15.
Nicolaus Damascenus, fragm. 143, 155-161; 3. 463.
Valerius Maximus, ii. 6.
Plutarch, ii. 499.
Mela, ii. 2; iii. 2.
Pausanias, iv. 2. 5.
Ælian, V. H. vii. 18.
Servius, fl. A.D. 390, ad Verg. Æn. vi. 228.
Theodoret, Or. ad Græcos, ix. p. 129.
Stephanus Byzantinus, *s. v.* *Γετία*.

With reference to this last-cited author it may be remarked that he makes no mention of any competition existing between the widows for the right of immolation on the occasion of the husband's death. To the fact, however, of such a competition existing we have the evidence, whatever it may be worth, of Herodotus v. 5, Cicero, Propertius, Diodorus, Strabo, Valerius Maximus, Nicolaus Damascenus, and Mela, *locc. citt.*

Grimm, Das Verbrennen der Leichen, Kleinere Schriften, p. 300, agrees with Strabo, xv. 1. 30, in considering as inadequate the reason reported or assigned by both Strabo and Diodorus, xvii. 91, for the origin of widow-burning, an institution for the establishment of which, as we know from Professor Max Müller, 'Chips from a German Workshop,' ii. 34, *ibique citatis*, it was necessary to falsify the Vedas. He does not say why he repudiates the reason mentioned by those two writers, *ὅτι ἐρῶσαί ποτε τῶν νέων αἱ γυναῖκες ἀφίσταιντο τῶν ἀνδρῶν ἢ φαρμακεύοιεν αὐτούς*, which however does not appear a wholly improbable one; nor, though he refers, p. 296 note,

of the practice of human sacrifice having persisted in this part of the world into perfectly historical times, 'paullo supra hanc memoriam,' as Julius phrases it, Bell. Gall. vi. 19, I have to say that the bones found in the long barrows of England do not seem to me to bear the interpretation which Dr. Thurnam has put upon them. Two of the sets of bones from long barrows which Dr. Thurnam has described as furnishing evidence which would 'convince the most incredulous,' those, to wit, from the Ebberston and those from the Rodmarton long barrows, are now in the Oxford University Museum, and I have compared them with a considerable number of skulls about the *ante mortem* character of the lesions on which, whether recovered from or not, there is no doubt whatever. Amongst these latter skulls I may specify a number of dried and prepared New Zealand 'heads' in the Oxford University Museum, and the skulls numbered 2880 A, 2880 B, 2880 C, and 2902 A in the Museum of the Royal College of Surgeons. By the kindness of Professor Humphry I was allowed to examine Dr. Thurnam's collection in the Anatomical Museum at Cambridge.

The first point in which the fractured portions of skulls known to have been fractured *ante mortem* contrast with several of those described by Dr. Thurnam is their great inferiority in mere number. The skull of a man whom we know to have been hewn down by a metal sabre, or to have been killed, as the New Zealanders are known to have been, by a stone axe, may have some two or three

to Professor Max Müller's article, Zeitschrift der morgenl. Gesellschaft, bd. ix. 1855, does he specially mention the fact of the falsification of the Vedas. It is less excusable that Grimm should have written of the practice of widow-burning, of which both Strabo and Diodorus had spoken with reprobation, in the following terms, p. 307:—

'Wie hat sich die oft gefühllose Weichherzigkeit der neueren Luft gemacht gegen den herben Brauch des Mitverbrennens der Frauen im Alterthum, und doch billigen wir, dass die Ehe, wenn sie ihres (Gesetz ausdrückenden) Namens werth sei, ewig und unauflösbar heisze, und preisen als seltnes Glück, dass hoch-bejahrte Ehleute auf denselben Tag hingerafft werden. Denn erhebend ist es wenn gesagt werden konnte

'Bis sex lustra tori nox mitis et ultima clausit,
Arserunt uno funera bina rogo.' Martial, 10. 71.

Further references may be found in the Antiquitates Danicæ of Thomas Bartholinus, 1689, who says, p. 556, 'pleni sunt Historicorum libri, varias apud nationes, uxores maritis superstites simul cum defunctis crematos, vel super corpora eorum interfectas.'

In a later work on Danish antiquities, Arnkiel's Cimbrischen Heyden-Religion, 1702, four chapters, xv–xviii. pp. 97–135, are devoted to the four subjects of the burial of wives with their dead husbands, the burial of friends, the burial of captives, and the burial of slaves in honour of great men deceased.

Professor H. Schaaffhausen's article, 'Die Menschenfresserei und das Menschenopfer,' in the Archiv. für Anthropologie, iv. 1870, p. 245, is the most recent and one of the most valuable memoirs upon this subject.

broken surfaces in its vault; in the skulls on which Dr. Thurnam bases his inferences 'the angular fragments are so numerous that one might suppose the gashes had been inflicted in sheer wantonness;' Cran. Brit., pl. 59[1].

Now I submit that the principle of least action is at least as likely to have regulated the proceedings of ancient as of modern manslayers, and that the very fact of these ancient skulls being broken into such a multitude of fragments, a comminution which would have entailed an amount of trouble as purposeless in the eyes of those who would have had to go through it as it is repulsive in ours, is a *prima facie* improbability of the very first magnitude against the interpretation in question.

Leaving purely quantitative considerations and coming to the character of the fractures in each of the two sets of skulls, I have in the second place to say that the broken surfaces in the skull fragments described by Dr. Thurnam are, in spite of the very considerable variety which is observable in skull-surfaces, howsoever and whensoever fractured, very different as a whole from those of skulls which we positively know to have been cut into and through during life or immediately after death. It is true that the cut surfaces described by Dr. Thurnam may have a 'clean' and 'porcellanous' appearance; but in answer to this I have to say, firstly, that I have seen perfectly similar surfaces produced in the very old and altered skulls in question by accidental falls or impact or pressure; and that it was an occurrence of this kind happening in the case of a skull-bone from the cremation long barrow at Market

[1] A nearly equally valuable standard of comparison is furnished to us by the figures and description of chopped horses' bones given by Professor Engelhardt in his 'Denmark in the Early Iron Age,' pp. 70–71 (Eng. Trans. 1866). Of two of the skulls of these horses it is said that the incisions upon them are 'both deep and numerous,' one of them showing as many as six, the other as many as ten different cuts. The skulls from the long barrows are, unhappily for the interests of reconstruction, broken into much more numerous fragments; and Professor Steenstrup does not believe that the horse-bones in question were so cut while the animals were living, or had their flesh upon them; for 'a minutely-splintered fracture has been produced by the chip having been broken away from the bone by a vigorous twist of the sword, leaving a smooth sharply-cut surface; and this circumstance seems to indicate that these violent blows had been inflicted when the bones were no longer covered by flesh; for, if the flesh had still been on the bones, *these would probably have presented a more jagged or roughly splintered fracture.*' The words in italics relate to a state of things quite different from that quite correctly described by Dr. Thurnam (Principal Forms of Ancient British and Gaulish Skulls, 1865, p. 70) as presenting us with 'the edges of the divided bones perfectly sharp and clean, and the fragments themselves having a porcellanous character.' The reference to Engelhardt's work I owe to John Evans, Esq., F.R.S.

Weighton which first opened my eyes to the questionableness of Dr. Thurnam's theory. But, secondly, the broken surfaces in the skulls from Ebberston and Rodmarton have both their tables broken in the same or very nearly the same plane, and though an incision of this kind can be effected in a living skull by a vertically delivered blow, as it is not rarely effected in a dead and buried skull by a spade, the immense majority of wounds which we find on skulls known to have been struck by sword or axe have been inflicted in the way of oblique impact, as proved by the prismatic chip of bone which they have forced up out of its proper relations. It is well known that it is common enough even for a well-directed thrust with 'that queen of weapons the bayonet' to be deflected into innocuous obliquity even by such a surface as that of a rib; much more then would a stone-weapon be liable to be deflected from the denser and more resistent surface of the more mobile skull. Hence if these prehistoric crania had really been battered by prehistoric weapons we should expect to find a very large proportion of obliquely received wounds upon them. Just the reverse of this is the case with the fragmentary skulls which Dr. Thurnam and I myself have obtained from the long barrows both of the cremation and the non-cremation kinds. Numerous as are the fragments into which these skulls are broken up, it is rare for the line of fracture to pass otherwise than vertically through both tables, or to leave the inner table either projecting beyond the plane of the broken surface of the outer one or broken away for a greater square area than that lamina. The appearance presented by an aggregate of such skull-fragments is not unlike the aggregate of fragments resulting from the discharge of a firearm, pistol or other, so close to the base of the skull as to subject its vault to the sudden and enormous tension resulting from the explosion of the gunpowder. The results of such an injury may be seen in the multitudinously fractured skull No. 2902 A in the Museum of the Royal College of Surgeons of England, and will be found described at p. 64 of Mr. Heath's Jacksonian Prize Essay for 1867, published 1872. The instantaneous tension of the explosion may be seen in this case to have produced a great number of fragments with their broken surfaces even and vertical; but what such violent expansion produces momentarily on a tough skull, that, compression or other strain due to the settling of the soil, or indeed shock from disturbance in secondary burial, may very readily be understood to be competent to produce on a skull rendered fragile by the lapse of centuries. The

Ebberston barrow and the Market Weighton barrow, in which these fractures have been noted, were both of them cremation-barrows, and the action of fire, even when as at Ebberston imperfect, would be distinctly in favour of making the bones more brittle; and in these and in the other barrows the great age of the interments, which are undoubtedly of premetallic times, may be taken in part-explanation of the loss of resistance testified to by these fractures. It is remarkable that Dr. Thurnam (Cran. Brit., pl. 59) should have observed that 'the perfect skulls from these barrows, inferred to be those of chiefs, are of considerably more elongate type than those which are cleft,' and should have put on record the fact that two of his supposed cleft skulls should have had the frontal suture persistent and have possessed thus a broader and less dolicho-cephalic form,' i.e. have been a better filled and larger skull 'than the rest.' For, as is well known[1] and may be readily verified, better filled and larger skulls differ from smaller ones in having thinner walls and being more fragile; and to this, and not to any such cause as their having been the skulls of 'serfs of less pure blood than their lords,' a view contra-indicated by their size (p. 640), we may reasonably refer the fact of a large proportion of the broken skulls being broader than the unbroken.

I have further to remark that fractured surfaces such as those described by Dr. Thurnam, and interpreted by him as indicating slaughter of victims at the funeral of a chief, may be and often are found in skulls of skeletons buried singly and in skulls buried with relics[2], provided that they have been subjected to pressure from the shifting of soil or the downward settling of stones upon them. The first effect of such agencies appears to be the forcing inwards of the basi-cranial bones, a process analogous to that which Dr. Barnard Davis has described as taking place in the senile living body, and which other writers have spoken of as *impressio baseos cranii*. The second effect upon the vault of the skull thus deprived of its basal support may take either the direction of flattening out of the arch or that of compression of it from side to side. Those who are most familiar with the multiform and even grotesque shapes into which skulls thus crushed are distorted, and with the cleanness and sharpness

[1] See Weisbach, Schädelform der Rumänen, pp. 8, 12, 30.

[2] For example, the skull already spoken of at p. 596 as 'Rudstone, lxviii. 7,' had been broken into a very large number of fragments with even and vertical edges, and this though its walls were of great thickness. But with it the following relics were associated—a bronze knife, a perforated stone axe, a hammer of micaceous grit, and a flint implement.

and extent of the fissures, which pass sometimes more than half over their transverse arcs, will be slowest to accept Dr. Thurnam's interpretation of the fractured skulls in question. Until the fractures of which Dr. Thurnam has written are shown to me in a skull with its basi-cranial bones left, as they might be in a sacrificed victim, uninjured and *in situ*, I shall hesitate to refer them to the working of any but one of the two following *veræ causæ*, viz. (*a*) settling or sinking of the soil or stones in which the skulls have been laid; (*b*) the disturbance and violence necessitated by successive interments, and resulting, as has often been said, in a 'strangely huddled,' 'irregular confused' packing together of a great many skeletons in a very small space. The first of these causes I believe to have been the most frequent; the second, I am well assured, accounts for the injuries observable in the Rodmarton[1] and the Swell crania. Desiccation and other alterations of various kinds may often have powerfully co-operated towards the production of fissures in these skulls; but whilst the cracking of other organic bodies forbids us to forget the influence of drying, the way in which skulls are often found almost entirely 'perished' makes it clear that we must not leave chemical activities out of sight. These however would not be competent alone to produce lesions which could anyhow be mistaken for wounds.

There can, I allow, be no doubt that skeletons, burnt and unburnt, are frequently found so buried together as to leave no doubt that they were interred simultaneously. The very structure of a cremation long barrow as described above (p. 495) by Canon Greenwell shows that all the bodies it contains must have been subjected at one and the same time to the action of fire. Burnt bones again are not rarely found[2] in the cists and also in the urns

[1] Of the chamber in the Rodmarton barrow, which contained no less than thirteen skeletons, Canon Lysons wrote thus:—'Although most of the human bones exhibited no traces of cremation, some few had been burnt. The bones were all in great confusion, and some had been dragged into a corner.'—Proc. Soc. Ant. Lond., 1863, vol. ii. p. 278.

[2] Interments in urns giving proof of the presence in them of more than one body are recorded in the accounts given above of—

Barrow cxlv. 2. Two skeletons in one urn.
Barrow clxxxii. Woman and child in one urn.
Barrow cxcvii. Two adults in one urn.
Barrow ccv. 1. Two women and child.
Barrow ccv. 2. Two or three adults.

Interments in cists giving similar proof of the presence in them of more than one burnt body are recorded in the accounts given above of—

Barrow lxii. Two bodies.

of the ages subsequent to those of the long barrow builders which give unmistakeable evidence of the presence of more than one skeleton intimately intermingled. Finally, burnt and unburnt bodies[1] are sometimes found so interred together as to show certainly that the two modes of disposing of the dead body were from choice or necessity practised simultaneously. All this however does not prove that of the bodies thus found lying together one set belonged to one and another to another class of men. If one set of bones had really given evidence of the reception by their owners of injuries *ante mortem*, whilst the other was free from any marks of such lesions, there would have been some reason for accepting this view. This however I have shown not to be the case. Or, if it could be shown that in certain barrows one or more skeletons were arranged apart and carefully, whilst other skeletons were disposed around such principal interment but in such a way as to show that less care and trouble had been bestowed upon them, much probability would have attached to the view that these latter skeletons might have been those of captives or of slaves slaughtered in honour of the chief represented by the central interment. But I have shown above, pp. 530 and 535, that where a single undisturbed interment has been found in company with, though distinguishable from, a number of bones giving evidence of the presence with it of several other bodies, these latter bones give evidence of their having been placed as we find them with a certain pious painstaking which arranged them, when parts, not of a body, but of a skeleton, without anatomical knowledge, though obviously with a view to making room for the skeleton found undisturbed. What we have to deal with in such cases as those described above *l. c.* are cases of successive

Barrow lxxxii. Woman and child.
Barrow lxxxv. Two children.
Barrow cxxxiii. Two adults.

[1] See for this account of barrows x, xi, xiii, xxvi, lxix, clxi, clxxvi. For the practice of cremation and inhumation simultaneously, see Kemble, Horæ Ferales, p. 918; Neville's Saxon Obsequies, p. 11; Wylie, Archæologia, xxxvii. p. 456; Akerman, Archæologia, xxxviii. p. 85; Inventorium Sepulchrale, pp. 165, 195; Weinhold, *l. c.*, bd. xxix. p. 138, bd. xxx. p. 176; Lindenschmidt, Archiv für Anthropologie, iii. 114. Burning and inhumation are carried on simultaneously now amongst the Gonds. The women and children of the Máriá tribe are always buried, and Colonel Dalton, Ethnology of Bengal, p. 283, suggests that unmarried males may be similarly disposed of. In the Report of the Ethnological Committee of the Jubbulpore Exhibition, Nagpore, 1868, p. 81, it is stated that burning is considered most honourable amongst the Gonds, but being expensive is usually confined to the old.

interments; and if we figure to ourselves how the mingled and allied feelings of reverence and of terror would act upon the otherwise excitable nature of uncivilised men engaged in such a work, we shall have little difficulty in interpreting the phenomena presented to us by the bony remains without having recourse to the hypothesis of human sacrifices, a hypothesis incompatible at once with the care bestowed upon some and the injuries received by others of these remains. The question however here naturally arises, how is it that in the very large number of interments recorded in this book we have never come upon any bony remains bearing their evidence to the existence of a practice which is spoken of by such a very large number of literary witnesses? In answer to this I have to say that the literary evidence when duly considered proves simply that slaves and captives were slaughtered at the funeral of their lords without proving that they were allowed to lie beside them afterwards. The only passage I have met with which might be held to speak of a contiguity in the graves as well as a contemporaneity in the deaths of the masters and of the slaves is the passage in which Cæsar writes, as follows, of the funeral ceremonies of the Gauls, B. G. vi. 19: 'Funera sunt pro cultu Gallorum magnifica et sumptuosa; omniaque quæ vivis cordi fuisse arbitrantur in ignem inferunt, etiam animalia, ac, paullo supra hanc memoriam, servi et clientes, quos ab iis dilectos esse constabat, justis funeribus confectis, *una cremabantur*.' These two last words might seem to justify us in holding that of the burnt bones packed together in a cremation long barrow with no detectable differentiation indicative of distinctions of rank or position, some nevertheless may have belonged to conquerors, others to captives, or some to masters, others to slaves. If we compare however the words of Homer used in the account of the funeral of Patroclus we shall see that the words of Cæsar must not be interpreted too strictly. Achilles, Il. xxiii. 182, says distinctly that the twelve noble Trojan youths were burnt together with Patroclus—

> Δώδεκα μὲν Τρώων μεγαθύμων υἱέας ἐσθλοὺς
> Τοὺς ἅμα σοὶ πάντας πῦρ ἐσθίει—

using words as precise at first sight as Cæsar's *una cremabantur*; but a little further on, l. 239–243, we find him telling the other Greeks that they would have no difficulty in distinguishing the bones of Patroclus, for that they were in the middle of the funeral

pile, whilst the bones of the human and brute victims were lying apart from them at its edge—

> Ὀστέα Πατρόκλοιο Μενοιτιάδαο λέγωμεν
> Εὖ διαγιγνώσκοντες, ἀριφραδέα δὲ τέτυκται,
> Ἐν μέσσῃ γὰρ ἔκειτο πυρῇ, τοὶ δ' ἄλλοι ἄνευθεν
> Ἐσχατιῇ[1] καίοντ' ἐπιμὶξ, ἵπποι τε καὶ ἄνδρες.

According to the legend given by Bartholinus in his Antiquitates Danicæ, 1689, pp. 291–292, the spirit of the Icelandic Asmundus was unable to rest until the body of a slave, who had killed himself from unwillingness to survive his master, was removed from his tomb; and we may be quite sure that the haughty and harsh sentiment attributed to that hero, *Animoso vacuus locus melius placet quam mali comites*, must have been too strong in every age and country which tolerated human sacrifices to allow of any equality between master and slave being set up even in the grave. In two words, I can understand how the bones of slaughtered slaves or captives might lie 'scattered at the grave's mouth,' I cannot understand how they would be likely to find entrance into the tombs of the kings.

There would be no repugnance felt even by men most strongly imbued with those feelings of exclusiveness which Professor Nilsson ('Early Inhabitants of Scandinavia,' ed. Lubbock, p. 167, note) assures us are eminently characteristic of savage life, for joint burial with an equal, a relative, a friend, a wife or a favourite. The words of the prophet of Bethel (1 Kings xiii. 31), 'Lay my bones by his bones,' show us, as do the repeated notices in the same history of successive monarchs coming or not coming into the tombs of their fathers, the Hebrew feeling on this point; *σφαχθεῖσα συνθάπτεται τῷ ἀνδρί* are the words used by Herodotus (v. 5) in describing the death and burial of the Scythian widow; Greek sentiment has usually a distinctive beauty of its own, but the prayer of Patroclus, Il. xxiii. 83, 84, 91,

> Μὴ ἐμὰ σῶν ἀπάνευθε τιθήμεναι ὀστέ', Ἀχιλλεῦ,
> Ἀλλ' ὁμοῦ, ὡς ἐτράφημεν ἐν ὑμετέροισι δόμοισιν . . .
> Ὡς δὲ καὶ ὀστέα νῶϊν ὁμὴ σορὸς ἀμφικαλύπτοι,

is not more Greek than it is Turanian or Semitic; it expresses

[1] Ἐσχατιῇ appears to me to be used in contradistinction to *ἐν δὲ πυρῇ ὑπάτῃ* of line 165 *supra* and line 787 of book xxiv, and to furnish a good commentary on the words *ἐν τῇ λοιπῇ εὐρυχωρίῃ τῆς θήκης* used by Herodotus (iv. 71) in his account of the similar Scythian rites.

merely the feeling common to all humanity that they who were lovely and pleasant in their lives in their death should not be divided.

It still remains for me to put on record the little which I have been able to note in the way of abnormalities, pathological and other, in these prehistoric skeletons and skulls.

Of the non-pathological abnormalities observable in this series the persistence of the frontal suture is the only one which needs special notice. It is exceedingly rare for this suture to remain open in the earlier of the two series with which we have been dealing, whilst it is by no means uncommon to find it retaining its infantile patency after the coming of the brachy-cephalic race. Dr. Thurnam, writing in 1865 (Nat. Hist. Review, April, p. 245), said that of all the long-barrow skulls which he had examined, four only, one from the chambered-barrow at West Kennet, a second from the Rodmarton barrow (which has been frequently figured, e.g. Cran. Brit., pl. 59; Archæologia, xlii. pl. xiv.; Thesaurus Craniorum, p. 8), and two from the Dinnington long barrow (described by me in the Journal of Anatomy and Physiology, vol. iii. 1868, p. 254), had been found possessing this peculiarity. To this very small number I have, from all the Silurian skulls exhumed since 1865, only been able to add the skull of one adult, this one being the skull of the single skeleton found undisturbed in the long barrow at Upper Swell, as described by me at p. 529 *supra;* and one skull of a child of about 7 or 8 years of age, being one of the children found in the chamber of the long barrow at Eyford, described above, p. 518, and Journ. Anth. Institute, Oct. 1875, p. 158. Coupling these facts on one side with the well-known fact of the extreme rarity of the persistence of this frontal prolongation of the sagittal suture in the skulls of modern savages[1]; on another side with the fact that this

[1] This suture persists in a skull of an Andaman Islander presented to the Oxford Museum by Professor Wood Mason of the Indian Museum, Calcutta; it has been noted in an Abyssinian skull by Zuckerkandl, *l. c.* p. 65; it is seen in the figure of a skull given by Professor Busk (Natural History Review, April, 1861, pl. v. p. 174) of a Red Indian from an ancient burial-place in Tennessee, in which skull, Professor Busk informs us, 'the supra-orbital prominence is most marked of all the crania in our possession;' and fourthly, it is seen in the figure of the skull treated of by Professor Broca in his paper (in the Bulletin de la Société d'Anthropologie de Paris, Août, 1871), 'Sur la Déformation Toulousaine du Crâne,' of which we find it recorded that 'l'os frontal est très-petit dans toutes ses dimensions.' But though small frontal bones may occasionally retain this suture, there is no doubt that it is much more usually found in broad foreheads, and that the rationale of its formation lies in the early widening of the frontal lobes of the brain, of the segments, that is, of that organ which are most indubitably

suture persists with comparative frequency in the skulls of brachycephali as observed by His and Rütimeyer in the skulls of their 'Disentis Typus' (Cran. Helvetica, p. 27), and by Dr. Thurnam and myself in the skulls of the bronze and later periods; and on a third with the fact that frontal bones with a persistent suture are all but invariably broader than allied skulls not bifid, we may feel ourselves justified in considering the extreme rarity of this suture in Silurian skulls as another indication of their inferiority to those of the later or Cimbric race. And we are further justified in saying that Mr. Darwin has been misinformed when he says of this suture (Descent of Man, 1st ed. p. 124, 2nd ed. p. 39) that it persists 'more frequently in ancient than in recent crania, especially, as Canestrini has observed, in those exhumed from the Drift and belonging to the brachy-cephalic type.' The true *rationale* of the persistence of the frontal suture would appear to be that it is a teleological accommodation to the needs of the enlarging brain of an advancing civilisation, with which enlargement is correlated a diminution of the size of the jaws, and of the necessity for the rotation of the brain and the frontal bone backwards which has been so often noted here (see p. 643 *supra*) as occurring in macrognathous men, and which is carried out still further in the 'villainously low foreheads' of the apes.

We may now pass to the consideration of the few pathological deformations which have been noted in these prehistoric skulls and skeletons; and we may begin by recording

I. *Abnormal Ossifications.*

Dr. Thurnam in his 'Further Researches and Observations on the two principal Forms of Ancient British Skulls,' p. 33, suggested that some ethnical importance might attach to the fact that in

shown (see p. 676 *supra*) to increase in complexity and extent with increase of intelligence. This principle was laid down in the year 1740, by Hanauld in the Mémoires de l'Academie royale de Paris, p. 371; it has been reaffirmed by Dr. Theodor Simon, to whom I owe the foregoing reference, in an excellent though short paper in Virchow's Archiv, tom. 58, 1873; by Virchow himself, *l. c.*, tom. 13, 1858; Abhandlungen Akad. Wiss. Berlin, 1876, Ueber einige Merkmale niederer Menschen Rassen am Schädel, p. 112, *ibique citata;* and by Hyrtl, Lehrbuch der Anatomie des Menschen, 8th ed. 1863, p. 245. Welcker's views (given in his Wachsthum und Bau des Menschlichen Schädels, p. 99) as to the hereditary transmission of this peculiarity are confirmed by the presence of it in four out of the sixteen skulls recovered by me from the Dinnington tumulus. In two of these not mentioned by Dr. Thurnam the traces of the suture are only rudimentary; and in none of the four does it reach the inner table, which it does however in the Rodmarton and in the Upper Swell crania, both also in this Museum.

remains from the long barrows an 'anchylosed condition of two or more of the cervical or upper dorsal vertebræ' had been not rarely observed by him, whilst it was within his experience very uncommon and almost unknown in the round barrows. This condition of things he thought was indicative of some peculiarity, and that peculiarity the troglodytic mode of life of the people in whose remains it had been observed, and whose heads and necks he supposed would have been very much exposed to violent concussions against the sides and roofs of their narrow passages and doorways. Without discussing whether 'anchylosis of the vertebræ may have resulted from such violence,' I would say that I have observed the morbid condition of which Dr. Thurnam writes in many vertebral columns of much later times than those of the cave-dwellers. The Pathological Department of the Oxford University Museum contains, under the Catalogue-numbers 159–165, seven specimens with every appearance of being of modern date; and the magnificent Catalogue of the Leyden Anatomical Museum[1] has ten Plates (Taf. xxxviii–Taf. xlvii) devoted to this particular form of disease. Of the two specimens of this anchylosis which I have met with amongst prehistoric skeletons, one came from the long barrow at Upper Swell, described by me at p. 533 *supra*, and the other belonged to the skeleton 'Paulinus, iv. 2, cxiii. 5,' which came from a round barrow, and indeed may be taken as being a strikingly good representative of the skeletons of the bronze-period. The

[1] Museum Anatomicum Academiæ Lugduno-Batavæ. Descriptum ab Edvardo Sandifort. 1793-1835. There can be no doubt that this morbid condition is the same as the one spoken of by Rokitansky (Manual of Pathological Anatomy, vol. iii. pp. 133, 134, and 247), and described by him as presenting an appearance as if the 'bony matter had been *poured* in a stream over larger surfaces of a bone and had then coagulated.' Rokitansky adds, 'We are quite ignorant of any general condition of the system to which this can be attributed.' In default of any suggestion of his, it may be well to add the following short account of the malady from a later writer, Genczig, who in an Inaugural Dissertation (Ueber Exostosen und Osteophyten) read in 1846 speaks of the malady as follows, p. 14: 'Exostosen der Wirbelknochen. Am kaufigsten findet sich ein Osteophyt welches in der Form einer im Flusse erstarrten Masse die vordere Flache der Wirbelkörper in geringerer oder grösserer Ausdehnung mit einander verbindet. Bisweilen findet sich dies Osteophyt ein höheren Alter ohne anderweitige Krankheiten der Wirbelsäule, bisweilen aber auch bei Caries oder Tuberculose der Wirbelkorper.' I have myself observed this condition in the vertebral column of a Newfoundland dog and of a horse, which are preserved in the University Museum; it is said to be normally present in the dipodidæ and dasypodidæ, animals, it is right to add, of burrowing habits; but it is also present in many cetacea; and I find that its occurrence as an abnormality is so well known, as to have furnished commentators with a not very satisfactory explanation of Aristotle's twice repeated statement as to the cervical region of the lion consisting of one single bone (see A. F. A. Wiegmann, Observationes Zoologicæ Criticæ in Aristotelis Historiam Animalium, Berolini 1826; Arist. Hist. An. i. 1, ad fin.; De Part. An. iv. 10).

skull was noted by me as being 'typically brachy-cephalic both by contour and by measurement (cephalic index = ·82), and as having belonged to a strong man, 5 ft. 9 in. in height, and past the middle period of life.' Three of the dorsal vertebræ are glued together by bony deposit on the anterior, and to some extent on the lateral aspects of their centra. In this skeleton, as in two others, also of tall men, from the same neighbourhood and possibly the same clan, viz. 'Paulinus, viii. 2, xv. 2,' and 'Goodmanham, xiv, ci,' it is noteworthy that the last lumbar vertebra has anchylosed with the first sacral, and must, as it enters by its lateral outgrowths continuously into the mass of bone supporting the articular surface which abutted upon the ilium, have so anchylosed at an early period in development. The ensiform cartilage of this skeleton is also ossified, and other bones besides those already specified are similarly hyperostotic. Some of the skeletal bones on the other hand, and notably the scapulæ, show signs of senile atrophy and thinning, a point of importance to note, as regards both the cause and the time of the production of the vertebral and other hyperostoses.

A skeleton of a Little Andaman Islander described by Dr. Barnard Davis, Supplement to Thesaurus Craniorum, 1875, p. 95, appears to have exemplified almost every possible form of exostosis and synostosis, except the important form of bony anchylosis which consists in the more or less complete coalescence of the first cervical vertebra with the occipital bone. On this Professor Virchow has written at some length in his recently issued volume, Beiträge, pp. 340–345. Professor Virchow puts on record five cases of this variety, three of which have come under his own observation, whilst the other two have been described by Bogstra in conjunction with Boogaard and Friedlowsky. A somewhat larger number are described in the already cited Catalogue of the Leyden Anatomical Museum (vol. i. pp. 143, 144; vol. ii. Taf. xiv, Taf. xv; vol. iv. pp. 31, 46, Taf. clviii. fig. 1, 2, 3), with the remark that *ex descriptis speciminibus diversimode cranium cum atlante concrescere constat.* There are two specimens of this anchylosis in the Museum of the Royal College of Surgeons of London; one being an artificially distorted skull from Vancouver's Island, No. 5412 A, and the other, the existence of which was notified to me by Professor Flower, being the partly-burnt skull, No. 5903, which was supposed, but probably erroneously, to have belonged to a native of Van Diemen's Land. We have five specimens of this very interesting pathological deformation in the Oxford University

Museum, three in the Pathological Museum, and two in the Ethnological Series. Of the three in the Pathological Museum, one, No. 157, belonged to a man who died at the age of 73, and the second, third, and fourth cervical vertebræ are anchylosed to each other just as the atlas is anchylosed to the occipital. In this case, as in Friedlowsky's, the posterior arch of the atlas is left incomplete, an interval of two millimètres separating it into two halves. The second belonged to a boy who, after suffering from various scrofulous affections, died with cough, purulent expectoration, hectic, and vomicæ in the right lung, as well as extensive paralysis from, no doubt, encroachment effected by the odontoid upon the medulla oblongata. Of these two cases the first resembles one of the two recorded by Virchow from the Berlin Museum, in that death took place at an advanced age and without any recorded symptoms of disease connected with the lesion in question; the second resembles the second of those cases, in that long disease was the cause of death. The third specimen from the Oxford Pathological Department, No. 261, is the skull of a lunatic, purchased with the Collection of Schröder van der Kolk, the calvarial bones of which present, according to the Catalogue, 'a rugous wormeaten appearance, a consequence either of syphilis or tinea.' Our fourth specimen was obtained from a Roman cemetery at York, in which large numbers of skeletons were found buried in *putei* with very little regard to any consideration, except that of making the largest possible amount of room for the largest possible amount of bodies to be interred. No clue to its nationality, except in the political sense of subjectdom, therefore is available. The specimen however is of interest with reference to the question of the fœtal or congenital origin of the anchylosis, as not only the spheno-basilar synchondrosis would appear never to have been closed, but also the basilar portion of the occipital bone would appear to have been entirely absorbed, and the arch of the atlas to have coalesced all but perfectly with the occipital, two circular orifices only remaining for the outlets of the first spinal nerves. It is of interest further, as combining with this anchylosis, firstly the 'plastic deformation' of Dr. Barnard Davis, the 'basilar impression' of Virchow (*l. c.*); and secondly, a flattening and widening out of the cranial vault, the height from the edge of the anterior arch of the atlas next to the base of the brain up to the vertex being only 4″ as against a maxim width of 6·2″, as to give the skull what Dr. Barnard Davis calls a 'discoid,' and Virchow (*l. c.*) a 'molen-

förmig' appearance. Our fifth skull belonged to a man (Cowlam, lvii. 3, p. 215) of from twenty-five to thirty years of age, whose shortness of stature (5′ 1″) and ill-filledness of skull (with cephalic index of 76) would point to his having belonged to the stone age, a supposition which his archæological surroundings do not, I apprehend, contradict (see pp. 215–6 *supra*). In this skull a considerable part of the occipital bone has been lost, but on the left side its condyle has been left with the articular process of the atlas anchylosed to it without any trace of recent discontinuity.

Professor Virchow appears to consider these cases explicable by the action of an *arthritis chronica deformans;* Friedlowsky (Wiener Med. Jahrbücher, 1868, Bd. xv. p. 241; *cit.* Virchow, *l. c.*, p. 343) is inclined to believe them to be due to intra-uterine disease; in some cases I should suggest that they were the result of strumous disorganisation occurring in early life but recovered from, as we have seen recorded in two of the cases here referred to, so completely as to allow of a goodly old age being attained to. It is perhaps difficult to assign any other ethnological bearing to them than that which they have had conferred upon them by being discussed in the important ethnological memoir referred to.

The skeleton 'Goodmanham, xiv, ci,' already mentioned as having had the last lumbar vertebra anchylosed to the first sacral, presented another form of exostosis, which, as it did not affect the joints, cannot be ascribed to an arthritis (see Adams, *cit.* Paget, Lancet, Nov. 18, 1875). An osseous upgrowth on the tibia, 2″ long by ·6″ in height and ·35″ in width, roughened and perforated here and there, occupies the part of the popliteal line which is common to the popliteus and the inner head of the soleus; the bone is further beset by rough and by smooth exostosis on its border below this level, and is finally joined, by a stalactitic growth 1·25″ long and ·7″ thick, to the fibula.

That particular form of exostosis which produces in its most usual form what is called the puerperal osteophyte is by no means unrepresented in prehistoric series. As in modern times also, it is not confined to the female sex exclusively; a typically male skull of the brachy-cephalic type from a grave in a barrow at Gardham exemplifying it.

Finally, we have in the long barrow series from Market Weighton, Rodmarton, and Swell, that form of hyperostosis which developes masses of bones along the supraciliary ridges, as repeatedly observed in Australian and Tasmanian skulls (see Catalogue Ost. Series, Royal

College of Surgeons, vol. ii. 1853, Nos. 5317, 5318, 5324, 5345), as also in foreign skulls of prehistoric times, *e.g.* the Danish skulls from the Island of Seeland, as noted by Virchow (Arch. für Anthr. iv. p. 66; see also Spengel, *ibid.* viii. p. 59, 1875, and Journ. Anth. Inst. Oct. 1875, p. 170).

II. *Rickets.*

I am inclined to believe that we have an example of the working of what has been called an 'English disease,' viz. Rickets, in one skull of the bronze period, 'Rudstone, lxiii. 4,' p. 248. The calvaria of this cranium is so large relatively to its small facial skeleton and lower jaw, and has so distinctly the subquadrate outlines which we have learnt[1] to recognise as indicative of that false cerebral hypertrophy the essence of which consists in an increase, not of the nerve cells, but the interstitial neuroglia, that we are probably justified in considering it to have taken this shape and size in accommodation to a rickety brain.

The skull appears, from its small mastoids and small teeth and jaws, to have belonged to a woman, and somewhat difficult though the size and weight of the entire skull and the considerable development of the supraciliary ridges may make it to believe this, the existence of a considerable quantity of stalagmite-like exostosis on the interior of the frontal bone lends some additional probability to this view as to its sex, as does also the comparative verticality of the forehead and of the posterior part of the parietals. As rickets may appear, as Dr. Jenner (*l. c.* p. 466) has shown, in any child whose mother may have been in a depressed condition during the period of gestation, no matter whether the father may have been in 'robust health and the hygienic conditions most favourable,' there is no need for wondering at its appearance in a semi-civilised community, where early childbearing and hard labour would usually be the lot of the females. In the present case the malady had been outlived, and the subject of it, to judge from the great wear of the teeth and the obliteration of the skull sutures, had reached old age. The teeth are small in size, and only three molars appear to have been implanted in the jaws, two on the left, one on the right side.

[1] West, Diseases of Children, Lectures X and XLI, pp. 134 and 729, 5th edition, 1865; Jenner, Lectures on Rickets, Med. Times and Gazette, 1860; Virchow, Untersuchungen ueber die Entwickelung des Schädelgrundes, Berlin 1857, pp. 99–102, *ibique citata.*

The measurements of this skull are as follows:—

Extreme length	7·4″	approximatively. Interzygomatic width	4·7″
Extreme breadth	5·7″	approximatively. Interangular width of lower jaw	3·2″
Vertical height	5·8″	approximatively. Depth of symphysis	0·9″
Circumference	21·4″	approximatively. Width of ramus	1·2″
Length of face from fronto-nasal suture to edge of alveolar process	2·5″	Cephalic index	76
		Weight of skull with lower jaw but with loss of basicranial bones = 1 lb. 7¼ oz.	

A second skull, to which the foregoing description as to age, sex, contour and other characters, with a slight alteration as to the supraciliary ridges being smaller, would apply almost word for word, was obtained by Canon Greenwell from a cave at Ryhope in the county of Durham. With this skull and lower jaw there came to the University Museum from this cave a second lower jaw, which had belonged to a strong man, and resembles in many particulars the lower jaws of the earlier British prehistoric race; and the lower jaw of the skull altered by cerebral hypertrophy, has its angles inverted in a manner frequently noticeable in lower jaws of early races. These points have some importance, as some doubt exists as to the date of this 'cave-find.' The measurements of this Ryhope skull are as follows:—

Extreme length	7·4″	Interzygomatic breadth	4·7″
Extreme breadth	5 6″	Interangular width of lower jaw	3·1″
Vertical height	5·3″	Width of ramus	1·3″
Absolute height	5·0″	Depth of symphysis	0·9″
Circumference	20·8″	Weight of skull 1 lb. 5 oz. 70 grs.	
Length of face	2·3″		

III. *Diseases and irregularity of teeth in Prehistoric Series.*

Mr. Mummery in a valuable paper published firstly in the Transactions of the Odontological Society of Great Britain, vol. ii. p. 1, Nov. 1869, and subsequently (1870) in a separate form with additional notes, has given at considerable length, and also tabulated, the results of his observation upon dental disease as existing in prehistoric races, having examined for this purpose a large proportion of the series in the Oxford Museum and also several other collections. In the same paper he has also recorded the results of his investigation of dental disease in various existing savage tribes, such as the Australians, the Eskimos, the Negroes, and the Red Indians. Mr. Mummery has pointed out that amongst as many as 68 Wiltshire skulls of the long-barrow period in Dr. Thurnam's collection he could find only two cases of decay, whilst amongst 32 skulls in the

same collection from the round-barrow period there were 7 cases. In 60 Yorkshire dolicho-cephali, however, Mr. Mummery says no less than 24 exhibited more or less disease; and in 44 other skulls ranged with the long-barrow series, some from Mr. Bateman's Derbyshire series and some from other sources, much wearing down of the teeth and 9 cases of caries were noted; but alveolar abscesses were comparatively rare. In the Park Cwm tumulus in the peninsula of Gower, South Wales, described by Sir John Lubbock (Journal Ethn. Soc. London, vol. ii. 1870, pp. 416–419), and of the same 'horned' character and possibly of the same race and time as the Gloucester tumuli next to be spoken of, amongst skeletal remains representing 24 individuals, 21 of whom were adults, Dr. D. M. Douglas found 'the teeth wonderfully preserved, very good and regular,' and 'only two that exhibited signs of decay during life.' In my examination of the entire series of bones, fragmentary as well as perfect, from several chambers in long barrows in Gloucestershire, I find very much the same state of things which Mr. Mummery has described from the Wiltshire burials of the same period. Ten lower jaws, nine of which were from persons beyond the age of puberty, were recovered from a chamber in the long barrow described by Canon Greenwell, pp. 514–520 *supra*, and by me in the Journal of the Anthropological Institute, Oct. 1875, p. 160; and of them I write (*l. c.*), 'In none of these lower jaws had any teeth been lost before death, in only one is there any caries visible, and in one other (of an old woman, see p. 165) there is a cavity formed by an alveolar abscess in connection with a lower front molar worn down to the fangs and with its pulp cavities almost obliterated by osteodentine.' Similarly of the six lower jaws, all but one of which must have belonged to strong adult men, recovered from a chamber in the long barrow at Upper Swell described by Canon Greenwell at p. 521 *supra*, and by me at p. 168 of the Journal Anth. Soc. (*l. c.*) I write, 'In every case but one the full number of teeth was retained up to the time of death, even though the teeth are very much worn in most cases, and in some even down to close upon the fangs. There was only one case of caries.' I should have added that some traces of an alveolar abscess are to be seen in the jaw which had lost teeth before death, and that this jaw appears to have belonged to a man, whilst the jaw with caries belonged probably to a woman.

On the other hand, of the teeth of three females, also already described by me and all undoubtedly from the stone and bone

period (Journal Anth. Inst., vol. v. p. 152, and vol. vi. p. 34), a very different history has to be given. Of the first of these, from the barrow 'Nether Swell, ccxxix,' I write, 'The lower jaw is feeble. The mental foramen corresponds to the interval between the second bicuspid and first molar. The teeth are very much worn down, and there are two or three alveolar-abscess cavities in the jaw. One very large one occupies a great part of the molar region of the left upper maxilla.' One of the male skulls from this barrow shows the cavity of a small alveolar abscess; and in another several teeth had been lost before death. The second of these cases is that of the woman recorded at p. 518 *supra*, and Journal Anth. Soc., *l. c.*, p. 158, of whom in the latter place I say, 'The lower jaw of the old woman was feeblish as compared with some of the male jaws, but not with all, from these barrows. It had lost no teeth, from the half we recovered, during life, though the teeth were very much worn down, and the first molar, notably, down to its fangs; in connection with both of which there were alveolar abscesses.' Of the femur and other bones belonging to this skeleton I say that they 'give the idea of their owner having had hard work and poor food, viz. as they are slight, but with rough ridges.' The third instance is furnished by the history of the young woman found at Cissbury (Journ. Anth. Inst., vol. vi. p. 34), in whom an alveolar abscess existed in relation with a lower premolar, which had had its pulp cavity exposed by being broken across midway between its grinding surface and its neck. Here the two anterior molars were very much worn down, though their owner was not more than twenty-five years of age, and the wisdom teeth were scarcely worn at all. Subsequently to these excavations two lower jaws affected with alveolar abscesses, both of aged females, were found in the long barrow No. ccxxxii, described by me above, p. 524; another similarly affected, but from a powerful old male subject, was found in the same barrow. A third as yet undescribed skull of an old woman of the stone period, with extensive traces of the same mischief, was presented to me by the late Rev. Canon Lysons, having been obtained by him from a long barrow in Gloucestershire; and three of the Rodmarton long-barrow skulls, also from the collection of that antiquary, one of an old man, one of the young man already referred to (p. 694 *supra*), and one of an old woman, have suffered similarly. Of eight lower jaws, of all ages and both sexes, discovered by Edward Laws, Esq., in a cave near Tenby (see Journ. Anthrop. Institute, July, 1877),

to the early date of which their possession of the 'priscan' peculiarities specified above (pp. 645–652) speak as decisively as their archæological surroundings, one only, a lower jaw of a man, had been affected by alveolar abscess. From the Westow long-barrow series (see p. 494 *supra*) no lower jaw thus affected has been recovered; from the Rudstone long barrow (see p. 497 *supra*) only one, (the one described above, p. 613, as) of a man; from the Ebberston long barrow (see p. 484 *supra*) only one of a woman[1].

Further investigations may possibly reverse this relation of numerical superiority on the side of the female sex in the matter of alveolar abscesses. I am inclined however to connect it with the harder life and scantier fare which are the lot of women in most savage races, upon which I have here (p. 659 *supra*) and elsewhere[2] insisted as accounting for the greater inferiority in stature and in bulk which existed and exists between men and women in many ancient and in many modern savage races.

Feeble general physique is correlated, as Mr. Mummery's examination of modern savage races (pp. 47, 51–54, 60, 63) in Africa, China, Australia, and elsewhere has shown us, with deterioration of the state of the teeth, and this, howsoever, whether by too small a proportion of animal to vegetable food in their dietary, by frequent privation of food altogether, or by general anti-hygienic conditions, this feebleness may have been produced. To realise the working of the two former of these causes among the prehistoric inhabitants of these islands, and especially the women, there is little need of imagination; I think however that from our present familiarity with the production of anti-hygienic conditions by the crowding of a superabundant population within solid walls, from our lack of familiarity with tent life and savage life, we may underrate the extent to which unhealthy conditions may, or indeed must have prevailed in the dwellings even of sparse populations in days so long before the invention not merely of glass but of many other things in which in these days 'our basest beggars are superfluous.' It is obvious however upon the smallest

[1] In none of these cases have I seen any traces of the simple but relief-producing operation of extraction, or of other evidence to show that in this, any more than in any other sphere, 'the former days were better than these.' The same lesson may be gathered analogically from observations made upon the remains of modern savages, Mr. Mummery informing us (*l. c.*, p. 47) that he has 'met in Australian jaws with every form of dental disease with which we are familiar amongst the English race.'

[2] Journal Anth. Inst., Oct. 1875, p. 121 note; British Association Report, 1875, p. 152; Archæologia, xlii. 1870, p. 457.

consideration, even in the absence of any personal acquaintance with present savage life, that the dwellings of the races we are dealing with must have been dark and crowded to secure warmth, and that the female portion of the tribe would have a larger share of these as of other depressing influences to contend with than the males. And the effects of these influences would show themselves as surely and clearly in the teeth, a system most closely correlated with the general state of the whole organism, as in their feebler trunk and limb bones[1]. The great frequency of the perforation in the olecranic fossa of female prehistoric humeri, noticed by Broca (Mémoires, ii. p. 366, and Rev. d'Anthropologie, 1873, ii. p. 15) and instanced by me (Journ. Anth. Inst., v. pp. 149–159, 161–169) in four cases from the Swell long barrows, is to be similarly explained; and, conversely, its absence in the Cro-Magnon and Mentone skeletons, which belonged to the 'giants' of tradition.

I have not, though constantly careful in looking for irregularities in dentition, found many in either of the prehistoric series which I have examined. Three of retardation of one or both bicuspids with retention of the second milk molar in persons of fourteen to fifteen years of age ('Jarrett, cxix,' p. 328, 'Money Hill, cxxi. 3,' p. 330, and 'Flixton, lxxi. 1,' p. 275) may be mentioned and compared with the similar cases given at p. 237 of the second edition of the System of Dental Surgery by J. Tomes and C. S. Tomes. Another of the retention of a wisdom tooth, with its upper surface only just visible above the alveolus in an aged female skull, 'Cowlam, lvii. 3,' p. 216, may be mentioned as exemplifying another kind of retardation which is perhaps more common among women than men, as is also, I incline to think, the entire obsolescence of the wisdom teeth.

[1] The slovenly habits of savages, carnivorous as well as vegetarian, by allowing of the admixture of sand with their food, furnish a very efficient means for wearing down of the teeth. But the inland tribes, who, like the outcasts described in the book of Job (chap. xxx. ver. 3–8), 'cut up mallows by the bushes, and juniper roots for their meat,' suffer more from the secondary consequences of such wear, which we have been speaking of as alveolar abscesses, than do the game-, fish-, or shellfish-eating races, such as the tribes represented by the Cro-Magnon and Mentone skeletons, or the Eskimos and Vancouver Island Red Indians. For the action of unintentionally introduced sand, see Wilson, Canadian Journal, Sept. 1862, p. 12, March, 1863, p. 151; Mummery, *l. c.*, pp. 35, 36; Pengelly, Trans. Devon Association, 1874, vi. p. 307, compared with p. 302, where the cave earth of the Mentone Cave is described as being 'a perfectly dry, very fine, incoherent, greenish sand.' For the wear of the teeth in the Cro-Magnon skeletons, see Broca, Mémoires, ii. pp. 166–168; for that of the skulls from the Caverne de l'Homme Mort, see Revue d'Anthropologie, 1873, ii. p. 17. The similar sufferings of later races in possession of cerealia may be referred to the detritus of their querns and grain-crushers.

The somewhat rare anomaly constituted by the presence of two roots to the lower canine has been noted by me in lower jaws from no less than five of the earlier interments treated of in this book; from, to wit, the long barrow ccxxix. at Nether Swell, described above at p. 513, and by me in the Journal of the Anthropological Institute, Oct. 1875, vol. v.; from the cremation long barrow at Ebberston (p. 484 *supra*); from the chambered long barrow at Rodmarton (Cran. Brit., pl. 59); from the Dinnington[1] barrow, described by me in the Journal of Anatomy and Physiology, 1868, vol. iii. p. 254; and, fifthly, from the Longberry Cave, near Tenby, examined by Mr. Laws (see p. 703 *supra*). The importance of this, which may appear to some readers to be a curious rather than a significant fact, will be seen very plainly when I add that all the other lower jaws from every period, inclusively of the bronze down to the present day, and from almost every variety of our species available in the ethnological series of the Oxford Museum for this comparison, have only furnished to me seven specimens with similarly bifid canine-fangs, and that of these seven only one belonged to a modern civilised race. This one presented other anomalies in its dentition which should render it perhaps unnecessary to consider it here, and the same may perhaps be said of yet another of these seven, inasmuch as it belonged to the skull 'Rudstone, lxiii. 4,' which has already been referred to (above, pp. 700–701) as fur-

[1] Some doubt may attach to the assignment of the Dinnington barrow to the long-barrow period. I was not an eyewitness of the examination of it, though I, subsequently to the removal of it, made inquiries on the spot from persons concerned in that work, and recorded them *l. c.* Eighteen more or less perfect skulls had been reinterred after the removal of the barrow; these, through the kindness of J. C. Athorpe Esq., I recovered; they are all dolicho-cephalic, and measurements of them were taken by Dr. Thurnam and recorded in the Memoirs of the Anthropological Society of London, vol. i., and Crania Britannica, tab. ii. p. 242. Casts of one of these skulls have been taken and are referred to by Welcker, Archiv für Anthropologie, i. 1, p. 149, and by Ecker, ibid. i. 2, p. 283, as illustrating well the '*Reihengräber*' form of the latter anthropologist; and Dr. Barnard Davis has described this cast in his 'Thesaurus Craniorum,' p. 10, as being 'very large, even enormous,' and 'subscapho-cephalic.' I may mention in support of the view, which however I do not hold to be absolutely proved, that this barrow should take rank with those of the neolithic age, that out of twelve lower jaws recovered by me from the reinterment, no less than six combine the wide ramus, the short coronoid, and shallow sigmoid notch so characteristic of priscan jaws, with a rounded and slightly inverted angle; whilst in three of the other six the same rounding of the angle of the jaw is present with the same inversion, sometimes considered peculiarly significant; and that whilst in many cases the chin has an eminently feeble, in none of them has it the powerful development so common in the lower jaws of the later occupants of this country.

For other references to this Dinnington barrow, see Bulletin Soc. Anthrop. Paris, ser. i. vol. v. pp. 541, 578; Natural History Review, April, 1865, p. 245; Archæologia, xlii. p. 171.

nishing some evidence for the existence of the disease rickets in the bronze period. Of the other five, one was found amongst more than a hundred Peruvian crania obtained from the collections made by Consul Hutchinson; two came to me from among six lower jaws collected for me in South Africa by the late Mr. Frank Oates of Christ Church, the small size, low coronoids, and feeble chins of which indicate that they probably belonged, as reported, to an outcast tribe, probably Bushman; a fourth belonged to a 'pure-blooded Gond,' as guaranteed by the donor, Captain H. A. Hammond, from Chindwara in Central India; the fifth, curiously enough and also suggestively, belonged to one of the South Welsh skeletons buried in the time of Charles I, as referred to above, pp. 565–566, note.

Pruner Bey (Bull. Soc. Anth. Paris, ser. ii. tom. ii. p. 244, 1867) has recorded the discovery of a similarly bifid canine from the famous cave-find of Naulette, in which, it may be added, evidence of a lower-jaw wisdom tooth with quinquefid fangs, and of extremely small incisors, was also found (ibid. tom. i. p. 587). The transversely placed sockets of these fangs are very frequently represented rudimentarily by raised ribs on the walls of undivided sockets, and the same may be said of the sockets of the lower premolars, which however I have never seen bifid, but which, judging from the position of these raised ridges, would have had such double fangs placed transversely to the jaw like those of the canines, not anteroposteriorly like those of the molars behind them, or of their homologues in Simiadæ.

If the importance of the fact of the greater relative frequency of bifidity of the lower canine-fang in 'priscan' races and modern '*Naturvölker*' is plain enough, the same cannot be said of the interpretation or signification of the fact. In none of the recent, nor, so far as I can learn from plates, in any of the fossil Simiadæ, has any fission of the fang of a canine been observed; indeed the lower-jaw canines in this family with their single fangs and the lower-jaw premolars with their invariably double ones differ from their human homologues more strikingly than do any of their other teeth. It is true that in some even of the Cynomorphous Simiadæ the fang of the lower canine is laterally grooved as well as laterally compressed; and in the gorilla the long diameter of the oval section of this fang forms a much more widely open angle mesially with the long axis of the molar series than it does in the chimpanzee or orang. Still these are but approximations to what is fully carried

in the bifidity of the human canine fang; and though we may speak of them, therefore, as 'anthropoid,' we cannot speak of it as 'pithecoid.' To my thinking a fair expression of the facts may be given by saying, the interchangeability of form which exists between 'canines' and 'premolars,' but which ordinarily requires for its illustration the comparison of two distinct species, is exemplified by different varieties within the limits of our own single species. If in this instance we have to go as far afield as are such animals as *Galeopithecus*, *Erinaceus*, and *Talpa*, to understand how a so-called 'canine' can become 'premolariform' and develope two fangs, it is but one instance out of many which show that many questions in anthropology can be read only in the light furnished by comparative anatomy[1].

I have not observed in these series any wisdom teeth with that larger development which is so commonly noticeable in the dental series of Australians as compared even with other black races, not to say with Europeans. Rather indeed the reverse, the wisdom teeth being often very small, especially in female skulls of the earlier series. Nor in spite of the grinding down which is so marked a feature in many of these skulls, as for example in the skull of the woman from Cissbury, described by me in the Journal of the Anthropological Institute, vol. vi. p. 34, have I ever observed the eruption of these teeth to have been provoked, as is sometimes the case in savage races, into taking precedence of the union by ossification of the occipital and sphenoid bones. Such precedence has been noted by Professor Broca[2] in one of the Cro-Magnon skulls; and from his comparison of the skulls of various modern savages between the ages of eighteen and twenty-five with skulls of modern Europeans at the same period of life, it results that this peculiarity must be considered as a mark of degradation.

Several other notes of inferiority which are commonly found in savage races of modern days, and which have been described as existing in the remains of troglodytic man, are wanting in the neolithic skeletons which I have examined. Foremost amongst

[1] For a philosophical discussion of the homologies and nomenclature and the interchangeability of form in mammalian teeth, see Messrs. Moseley and Lankester, Journal of Anatomy and Physiology, Nov. 1868, ser. ii. No. iii. p. 73, and Mr. C. S. Tomes, Manual of Dental Anatomy, 1876, p. 260.

[2] See Revue d'Anthropologie, 1873, ii. p. 20. Dr. Barnard Davis in his 'Thesaurus Craniorum,' 1867, p. 309, observes of a Loyalty islander, 'æt. c. 25,' that 'the synchondrosis sphenobasilaris is not quite ossified, yet all the teeth have been cut.' This is the ordinary sequence in the lower animals.

these may be mentioned prognathism; a peculiarity which our knowledge of the extent to which the jaws are modifiable and modified by the nature of the dietary alike in the lower races of man and in the lower animals, would certainly lead us to expect to find amongst a stone- and bone-using people. But, as it has often been remarked[1], the facial angle of these early races is by no means small, and their jaws have none of that pithecoid elongation which is so striking and prominent a characteristic in the crania of many still existing savages. On the other hand, prognathic and macrognathic jaws are not rare, though they are not the rule, in series from the bronze, and also from the early iron period in this country.

A second mark of inferiority, not entirely unexampled among modern savages, the junction, namely, of the squamous to the frontal bone, has never to my knowledge been observed in any prehistoric crania. If this peculiarity had been present its significance would have been very great, as denoting a curtailment of the part of the brain which, corresponding to the great ala of the spheroid in the skull, is eminently favorably conditioned, both as regards vascular supply and histological constitution.

I have already remarked (pp. 640, 650 *supra*, and Journ. Anthrop. Inst., vol. v. p. 126) that a third mark of inferiority, that, namely, which is constituted by diminution of the height of the skull, absolutely as well as relatively to its long and transverse diameters, is not usually noticeable, except in the female skulls of the dolichocephalic long-barrow race. To this may be added that in the series from the Caverne de l'Homme Mort, belonging to an early period of the neolithic age, Professor Broca found the height of the female actually exceeding that of the male skulls in the proportion of 132 millimètres to 131.

If we miss in these neolithic crania the diminution of the height of the skull which Professor Busk has, under the name of 'tapeinocephaly,' noted in certain modern savages, we look almost equally in vain amongst them for a fourth point of degradation, the elongation, to wit, of the basicranial axis; a peculiarity which Professor Cleland has rightly insisted upon (Phil. Trans., 1870, p. 124) as being strikingly and remarkably characteristic of uncivilised nations as distinct ethnographically as the Esquimaux, the Kafirs, and the Caribs.

[1] Broca, Mémoires, ii. p. 197; Rev. Anth., *l. c.*, p. 19; Thurnam, Principal Forms p. 32.

I have already (p. 639[1]) noted that the *basis cranii* in these ancient crania has never been found by me to have suffered from that pathological degradation which is known as the 'plastic deformation' of Dr. Barnard Davis, the 'basilar impression' of Virchow, the '*impressio baseos cranii*' of other authors.

The nasal index, which fails to separate the Eskimo from the civilised races, fails equally with the long-barrow skulls, and, as has been pointed out by Professor Broca (Rev. Anth., 1873, ii. p. 19), with other prehistoric European skulls. On the other hand, the orbital index, which does put the prehistoric crania from Cro-Magnon and the Caverne de l'Homme into a position of similarity to skulls such as those of the Tasmanian, Australian, and Melanesian races, puts the neolithic skulls of British barrows into a position of superiority as compared, not merely with the modern savages just mentioned, but even with the skulls of the bronze period. As regards these latter skulls however, it should be remarked that the transversely oblong outline which their orbital border sometimes assumes, as in the skulls 'Heslerton Wold,' described and figured at pp. 579–580, and 'Rudstone, lxiii,' described and figured at pp. 590–591, is due to an excessive downgrowth of the supraciliary ridges, rather than to any curtailment of the distance between the actual roof of the orbit and its inferior or maxillary border. In other words, just as the prognathism of modern savages may depend simply upon increase in size of the anterior alveolar segment of the upper jaw, so a low orbital index may be and often is due to a downgrowth of the upper border of the orbit, which comes thus to lie in a plane much lower than that which the true roof of the orbit occupies.

Professor Broca, in his account of the skulls from the Caverne de l'Homme Mort (Rev. Anth. *l. c.* pp. 26–28), after enumerating the various points in which those nineteen crania contrast and agree severally with those of the earlier race represented at Les Eyzies on the one hand, and with those of later races on the other, declares himself of opinion that the race to which they belong, whilst affined to the palæolithic man, has no longer any distinct representatives upon

[1] The references made by me elsewhere (pp. 689-698 *supra*) to this interesting pathological change were made merely for the sake of illustration. Dr. Barnard Davis's paper was read before the Anthropological Society of Paris, June 5, 1862, and may be found in Mem. Soc. Anthrop. de Paris, tom. i. p. 380. Subsequently a memoir upon the subject was published by Dr. Boogaard in the Nederland Tijdschrift voor Geneeskunde, 1865, 2. p. 81, an analysis of which by Dr. W. D. Moore appeared in the Cambridge and Edinburgh Journal of Anatomy and Physiology, Nov. 1866, p. 179.

the area which it once, however imperfectly, occupied. It must be very difficult to attain to anything like perfect certainty upon such a point in view on the one side of the tenacity with which so-called 'indigenous' or 'autochthonous' races retain, in whatever political or social status, a foothold in their 'aboriginal' country; and, on the other, of the modifying influence which the introduction of agricultural and other improvements may have exercised in the course of many centuries. Without going, however, further into this question, I will say that a comparison of the skulls here dealt with from the stone and bronze periods with those of the mediæval and modern tenants of these islands, coupled with other considerations and carried on for a considerable number of years, has inclined me to hold that the two prehistoric races, though outnumbered greatly by Anglo-Saxons, are still represented in the population of Great Britain and Ireland. The short-statured, dark-haired, long-headed race which is found not only making up nearly the whole population of large 'Welsh'-speaking districts in Wales itself and in the Highlands of Scotland, but also mixed up, and in very large proportions, with the population occupying midland-county districts usually held to have been entirely Saxonised and Danicised, as pointed out long ago (see p. 679 *supra*) by Professor Phillips, we have many reasons for holding to be the lineal descendants of our long-barrow people. In the north of England we find that the neolithic race amalgamated peacefully with the brachy-cephalic stock which taught them the use of bronze; and in the early iron period (see p. 683 *supra*) the earlier race appears to have regained some of its numerical preponderance, the late Celts from the East Riding and elsewhere north of Yorkshire having been mostly dolicho-cephalic. The bronze-using race seems, in the southern parts of this country, to have more completely absorbed or destroyed the dolicho-cephalic than it did in the north, resembling in this the dolmen-builders of France, whose predominance brought about an almost entire disappearance of their neolithic and troglodytic predecessors (see Broca, Revue d'Anthropologie, ii. pp. 49, 50, iv. p. 608). Still a race with many of the physical peculiarities of the long-barrow people is represented in great abundance in the cemeteries of the centuries during which this country was divided into Roman latifundia and forest-land; and whatever may have been their social or political *status*, the dolicho-cephali enjoy in such interments a great numerical superiority as compared with the brachy-cephali. The 'Saxon' or 'English' conquerors of this country have been shown (see Archæologia, xlii.

p. 460; Proceedings of the Royal Institution, 1870, p. 118) from the examination of their burial-grounds, as well as of other evidence, to have displaced the population they found in occupation of it as entirely and completely[1] as it has ever been found possible for invaders to do. The existence in the England of those days of large woods and forests and marshes, a point dwelt upon by Professor Pearson at pp. 4 and 24, and illustrated by several of his 'Historical Maps of England,' must have made the entire extirpation of the Romano-British population an impossibility[2]; and enables us to understand how even in the time of Canute British outlaws carried on brigandage even in such counties as Huntingdonshire.

There is of course no need to adduce any argument in favour of the self-evident proposition that the brachy-cephalic metal-using Celt was in date but of yesterday as compared with the troglodytic men of the continent; but the line of argument which may be employed in favour of this conclusion as regards the neolithic man of our long barrows, that, namely, such as it is, which rests upon the continuity of descent which appears to connect this stock with the dark Welsh and Gael of our own days and country, would not admit of being so used as regards the later race. For, as has been above (pp. 126, 630, 631, 681) pointed out[3], the cranial and skeletal characters of the bronze-using Celt are very closely similar

[1] In this, which appears to have been a very thoroughly Teutonised district, the crania of the present agricultural population appear to me to be very closely similar to or indeed scarcely distinguishable from those of the Saxons of the times when they first discontinued cremation.

[2] Captain Thomas (Proc. Soc. Ant. Scot., April, 1876, xi. part ii. p. 504) may be quite right as to his 'theory of the entire removal by slaughter or flight of the Celtic people' of the Hebrides; but the evidence from 'place-names' is not by itself sufficient to support this conclusion. The 'place-names' in many districts of England in which the so-called 'Black Celts' are still largely represented, will be found to be exclusively Scandinavian or Saxon. Small islands of course which have neither dense woods nor lofty mountains to serve as refuges to their occupants may, as the miserable history of the Greek Archipelago has shown from the time of Datis and Artaphernes (Hdt. vi. 31) down to our own, have their inhabitants entirely extirpated. And this may have been the case when the Hebrides were invaded by the Northmen. But as regards larger islands and continental areas the lines from Wordsworth's 'Poems dedicated to National Independence and Liberty,'

'Two voices are there; one is of the sea,
One of the mountains,'

need to be supplemented by a mention of woodlands.

[3] The very frequent discovery of amber ornaments in round barrows may be fairly considered as an argument in favour of their 'Cimbric' or 'Baltic' origin. Mr. Spence Bate (see Trans. Devon Assoc. 1872) considers the beautiful amber dagger-pommel found in a round barrow on Dartmoor as evidence for the 'Scandinavian' character of the interment. For amber-ornaments on bronze weapons, see Montelius, Congr. Internat. Anth. C. R. Stockholm, ii. 833, and Catalogue, Stockholm Museum, 1876, p. 40.

to those of the mediæval and modern Dane; and this similarity must of course make it difficult to decide whether the brachy-cephalism of many crania procurable from mediæval and especially urban mediæval interments, is to be referred to the persistence of such a brachy-cephalic prehistoric stock, or to the admixture of Danish blood in historic times upon which writers such as Worsaae (The Danes and Norwegians in England, Scotland, and Ireland, 1852) and Isaac Taylor (Words and Places, 1865, p. 183) have insisted with so much force. The discovery however by Dr. Thurnam and myself[1] of numerous skeletons of a typically brachy-cephalic tribe in a tumulus belonging to a period close upon that of the Saxon invasion, and situated at Crawley in Oxfordshire within the shadow of the protecting Forest of Wychwood, renders it exceedingly probable that this vigorous race, after surviving three centuries of Roman rule, may have endured till, at the commencement of the historical Danish invasion and immigration, there came into this country a stock to which they are beyond doubt physically, and probably also ethnographically, most closely allied.

The probable continuity in the way of descent of the long-barrow people with certain varieties of our present population, considered together with the fact that in these series we miss certain marks of degradation which are recognisable in the confessedly more ancient remains from certain continental 'finds' may tend to produce in the mind of a reader an exaggerated as well as a somewhat mortifying notion of their inferiority in the matter of antiquity. I will therefore, in conclusion and very shortly, enumerate the various physical peculiarities of an anatomical, to the exclusion of an archæological, kind which have in spite of all the considerations just put forward impressed me very deeply with a conviction of the immense distance which separates our time from that of the long barrows. First amongst these I should put the smallness of many of the skeletal and of the cranial bones both, which I have obtained from the long barrows alike of the cremation-kind, as in the East Riding of Yorkshire, and of the inhumation-kind in Gloucestershire. It is true enough that powerful skeletons and very large skulls have been found by me in these British as well as by many other investigators in many other interments of the same and of earlier ages. So generally accepted[2] indeed is this *a priori* surprising fact that we find writers such as Virchow (Archiv für Anthro-

[1] Archæologia, 1870, xlii. p. 175, and *supra* p. 657.

[2] See British Association Report for 1875, p. 150.

pologie, 1873, vi. p. 92) speaking of the notion that savagery and inferiority are characteristics of the aboriginal population of Europe as being simply an arbitrary preconception, *der vorgefassten Meinung von der Wildheit und Inferiorität der europaischen Urbevolkerung*.

But against this criticism we have to set the following considerations; firstly, that the male skeletons in these tumuli are the skeletons of men who were chiefs, and chiefs in times and under conditions when such a position was held and kept only by men of force at once of character and *physique* (see *supra* pp. 640, 662, *ibique citata*); secondly, that even in these 'tombs of the kings' we find (see *supra* pp. 658, 660, 704) female skulls and female skeletons of disproportionate smallness; and, thirdly, that (see pp. 615, 651, 675 *supra*), mixed up in these tumuli with the large and well-filled male skulls there are not wanting 'ill-filled,' 'boat-shaped' crania, to parallel which we have to go far afield amongst modern 'Natur-völker;' or that, in technical language, the crania of the neolithic period were not rarely dolicho-cephalic in a way which justifies us in speaking of them as being *steno-cephalic*[1] and of their owners as being in contrast to modern civilised dolicho-cephali, *angustiores* rather than *latiores*. To the narrowness of the ill-fed brain the simplicity or obliteration of the sutures testifies often, even in the most fragmentary of the neolithic crania; in more perfect specimens we have the same conditions more forcibly impressed upon our imagination by the

[1] Professor Aeby in 1863 (Verhandl. Naturforsch. Gesell. Basel., iii. 4) proposed to divide all skulls into the two classes of Steno-cephalous and Dolicho-cephalous, having regard simply to the differences of breadth. In 1867, in his Schädelformen des Menschen und der Affen, p. 32, he again argues that this division should be substituted for that of Retzius, according to which skulls are similarly divided into two classes, but into Dolicho-cephalous and Brachy-cephalous by reference to the relation subsisting between their length and breadth. His words are as follows:—'Was er (Retzius) also für lang und kurz gehalten ist nichts anders als schmal und breit, und es scheiden sich die menschen nicht nach Dolicho-cephalie und Brachy-cephalie sondern nach Steno-cephalie und Eury-cephalie.' As there appears to be some tendency in recent writers, *e.g.* Zuckerkandl, Novara Reise, 1875, p. 65, to adopt this classification, it may be well to say here that with dolicho-cephaly and brachy-cephaly respectively many more properties are correlated than those which their mere etymology connotes. Some of these are of primary morphological (see p. 637 *supra*), others of primary physiological (see p. 677 *supra*) importance. Neither is it possible to overrate the ethnographical importance of the fact insisted upon (pp. 589, 648, 662, 664, 665 *supra*) that within the circumscription of dolicho-cephaly and brachy-cephaly both, a natural subdivision may be made by reference to this very matter of breadth. There are 'ill-filled' brachy-cephalic skulls as well as 'well-filled;' 'well-filled' dolicho-cephalic skulls as well as 'ill-filled;' and to use, as is now sometimes done, the word 'steno-cephalous' or 'schmalkopfige,' as convertible with dolicho-cephalous and as opposed to brachy-cephalous, is simply to ignore facts. These are excellently expressed by Professor Cleland's proposed quadrifid division of dolicho-cephali and brachy-cephali into *latiores* and *angustiores* respectively. See Phil. Trans. 1870, p. 148.

sight of the parietal and frontal eminences standing prominently out in relief upon the wall-sided and vertically-ridged cranium. If a contrast such as this can be shown to exist between a series of what were all but certainly the crania of the most favourably conditioned and best developed of the neolithic population and any mixed series of later times down to this day from cemeteries in this country, the contrast would undoubtedly have been very much more sharply pronounced if we had had before us representatives of all classes from those early times.

Secondly, though well shaped and capacious calvariæ with orthognathous upper jaws do abound in the series from the stone and bone ages, and after bearing a comparison, and by no means always to their own disadvantage, with modern specimens, may be only with difficulty distinguishable from them, the same can hardly be affirmed of that most distinctive bone, the lower jaw[1]. Enough

[1] The caves of Cro-Magnon and Mentone have furnished us with similar lower jaws from the palæolithic men whose remains have been found in them, but, as in the cases of the Bushman and the Tasmanian, these lower jaws were combined with the low orbit so different from that of the Esquimaux, the wide opening of which in the skull contrasts so strikingly with the oblique, slit-like aperture of the eyelids in their living heads. And the prognathism of the Esquimaux, though it is possible to lay too much weight upon this point, as also the convex malar portions of the maxillaries, will be held by many to differentiate him from the palæolithic and neolithic races both. On the other hand, Professor Broca (Rév. d'Anth., 1873, ii. pp. 26-28), with the remains from the Caverne de l'Homme Mort before him, has no difficulty in connecting these neolithic with the palæolithic men, and Professor Boyd Dawkins so long ago as 1866 (see 'Cave Hunting,' p. 359, *ibique citata*) collected a set of coincidences between the implements, works of art, and animal surroundings of these latter men and those of the Esquimaux, the number and variety of which it is difficult to explain except upon the hypothesis of some connection having subsisted between them. Colonel Lane Fox and Mr. C. E. Rance are cited in the 'Reliquiæ Aquitanicæ,' p. 284, as accepting and corroborating this view; and Sir John Lubbock at p. 262 of his edition of Nilsson's 'Early Inhabitants of Scandinavia,' whilst pointing out that Mr. Busk's identification of *Ursus priscus* with *Ursus ferox* gives us some additional 'reason for the belief that the Esquimaux once inhabitated Western Europe,' uses language of a more cautious character as regards this conclusion than perhaps he might have done had not the author whose work he was editing expressed himself (pp. 104, 141) as being so very distinctly opposed to it. Mr. Alexander C. Anderson, 'Reliquiæ Aquitanicæ,' p. 49, and M. Sauvage, *ibid.* p. 220, would appear to be of the same opinion as Nilsson; most recent anthropologists, however (see for example Mr. E. B. Tylor, 'Primitive Culture,' vol. i. pp. 64, 95, ed. 1873, or the various authorities, old and recent, cited in the Address to the Biological Section, British Association, Liverpool, 1870, p. 103), incline to accept the argument from identity of custom to identity of race.

As regards the language of the Esquimaux, Professor Sayce has told us (Contemp. Rev., April 1876, p. 722) that 'if we turn to the grammars of those savage tribes who best represent the infancy of mankind we shall find them marked by the greatest synthetic complexity. The involved and monstrous words of the polysynthetic languages of North America, where the Esquimaux *aglekkigiartorasuarnipok*, for instance, represents our "he goes away hastily and exerts himself to write," are really examples

has been said above (pp. 541, 645, 654, 655, 706) of the peculiar characteristics of the 'priscan' human lower jaw, of the tumid

of those primæval undecomposed sentences out of which the logical precision of a French grammar or the severe grandeur of a Semitic prophecy were eventually to come. Their cumbrous barbarism is due to poverty, not to profundity of thought. Relatively to the Bushman language, however, the same authority writes in answer to an enquiry of mine; 'As regards phonology, the Bushmen with their clicks certainly stand on a far lower level than the Esquimaux. . . . . In some grammatical points, moreover, the Bushman language is what you aptly term "poor stuff." Thus the plural is denoted by reduplication, and the verb has not been developed. However, we do not yet know as much about the Bushman dialects as is desirable. Where the Esquimaux—like most of the other inhabitants of the Old World—best represent the primitive condition of speech is in the structure of the sentence. The independent word has not yet been evolved out of it.'

I have above (p. 633) expressed my feeling of the strain which is put upon the imagination by the effort to think even of the neolithic races as genealogically connected with the palæolithic; and a still greater effort is of course required for putting in thought any still existing races into a similar relationship. The exertion necessary will however become lighter in proportion to the hold which the uniformitarian doctrines of modern geology obtain upon our minds, and in the meantime what is going on in the world at the present day may teach us that it has not always been easy, and may sometimes, even now, be impossible, entirely to extirpate a wild race of men in a wild country. Such were of course the men and the country of the cave and other palæolithic periods. Neither, I apprehend, is it meant by speaking of affinity as existing between these ancient races and the modern Esquimaux, that these stone- and bone-using men are to be connected together at all in the same way as the Massaliotes were connected with the Phocœans, or the Galatians of Asia Minor with the Gauls. No one supposes that an immigration has ever taken place from the district inhabited by the Esquimaux into the regions now occupied by the French, English, and Belgians. Nothing that is suggested by the facts goes beyond making us suppose that the countries in question were in the times in question occupied by a race of very considerable uniformity of physical structure, of habits, and of appliances for fighting their hard battle of life; and that the great changes which have since those 'unhappy far-off times' taken place alike in their inorganic and organic environment have broken those tribes up into fragments, of which some infinitesimal traces are perhaps still detectable amongst us, and of which the still widely-spread Esquimaux may, however altered in the course of ages, be with some probability held to be the most characteristic remnant.

I take this opportunity of drawing attention to two instances of the tenacity with which certain customs and practices have maintained themselves amongst some of the races which we have had under comparison, leaving to the reader the task of deciding how far such persistence may be explicable upon the principle *τὰ κακὰ συνάγει τοὺς ἀνθρώπους* (Arist. Rhetor., i. 6. 22), that community of needs and distresses brings all men together, and makes all men alike. First of these, as being less amenable than the other to the objection just referred to, I will put the singular aversion to fish as an article of food which has characterised certain of the inhabitants of Scotland from the time of Severus down to our own time and has been noted as something remarkable in the history of the modern Esquimaux. Dio Cassius (fl. A. D. 230), lib. lxxii. 21, p. 866 c, ed. Leunclavii, observes with the surprise not unnatural to an Italian, that the two most powerful British tribes, the Mœatæ and the Caledonii, though they have no agriculture, but are dependent upon the produce of pastoral and hunting life and fruits, such as nuts and acorns, make nevertheless no use of fish for food, though fish are available in countless and inexhaustible quantities: *ἔκ τε νομῆς καὶ θήρας ἀκροδύων τέ τινων ζῶντες, τῶν ἰχθύων ἀπείρων καὶ ἀπλέτων ὄντων οὐ γεύονται.* Logan, who in his work on the Scottish Gael (vol. ii. p. 125) says that Herodian, a contemporary of Dio Cassius, makes the same observation, a statement which I have not been able to verify, writes (*l. c.*) as

horizontal segment corresponding to its molar teeth, of its wide ramus, of its short coronoid process, of its feeble chin, of its rounded,

follows of the modern Highlanders:—'The Highlanders, notwithstanding the mention of fish in several old poems, certainly did never willingly make use of such food. It was a matter of astonishment to an English resident among them a century ago that the trout with which their streams were teeming remained entirely disregarded, but they retain a proverb which implies their contempt for fish-eaters, and the encouragement of government has not yet induced either the Scots, Welsh, or Irish to enter with spirit into the fish trading.' Later evidence is not wanting to the same effect.

The same peculiarity is recorded by Mr. Whymper in the Alpine Journal of May, 1870, with the same indications of surprise, as distinguishing the Esquimaux:—'Fish are plentiful on most parts of the Greenland coast, particularly cod, holibut, and salmon. But, although their quality is little, if at all, inferior to the best we can obtain in this country, the Greenlander does not care for them, he will eat them and does eat them, but he will seldom do so unless there is a great necessity. . . . . It is certain that in his heart of hearts he cares for none of them as food.'

Neither modern research among still existing savages (see 'Reliquiæ Aquitanicæ,' p. 95) nor ancient literature justifies the scepticism which has been expressed (see Sturzius in ed. Dio Cassius, 1824, vol. vi. p. 812; Selden, Mare Clausum, ii p. 127, ed. 1635) as to the abstinence from fish-food on the part of wild races living by the sea-side. Irrespectively of notices in the classical writers as to the prohibition of such food for religious reasons by Pythagoras, or in the cases of priests as in Egypt (Hdt. ii. 37), or as in the service of the Bona Dea (Julian, pp. 176, 177, ed. Lipsiæ, 1696), we have such abstinence on the part of early races repeatedly mentioned by them as a matter of wonder and contrast. Marsham (Can. Chron., Leipzig, 1676, p. 220) has improved upon the well-known remarks of Plato (Rep. iii. 404, or Trans. Jowett, ii. p. 231) and of Athenæus (Dipnosoph. iv. p. 157, ed. Leyden, 1612), following Meleager of Gadara, to the effect that the warriors of the Iliad did not eat fish, by pointing out that the same may be said of the luxurious Phœnicians and the Ithacan suitors of the Odyssey, and that it was only under the pressure of necessity that the sailors of Ulysses betook themselves to fishing (Od. μ. (xii.) 329-331):—

Ἀλλ' ὅτε δὴ νηὸς ἐξέφθιτο ἴδια πάντα,
Καὶ δὴ ἄγρην ἐφέπεσκον ἀλητεύοντες ἀνάγκῃ,
Ἰχθῦς ὄρνιθάς τε, φίλας ὅτι χεῖρας ἵκοιτο.

Similarly the lines of Horace (Sat. ii. 2. 46-48),—

'Haud ita pridem . . . . .
Tutus erat rhombus tutoque ciconia nido,'—

and those of Ovid (Fasti, vi. 173-179) show that even in the times of Augustus a tradition remained of the period when fish and fowl were not used in supplementation of mammalian meat, when 'Piscis adhuc illi populo sine fraude natabat,' though 'Sus erat in pretio.'

The second peculiarity which I wish to note is one recorded by the ancient Strabo (iii. 4, 16) and by his contemporaries Diodorus Siculus (v. 33) and Catullus (xxxv, xxxvii) as distinguishing the Iberians and Celtiberians of their time; and by the modern Egede (Description of Greenland, second edition, London, 1818, p. 127; French edition, 1763, p. 98, *cit.* Sir John Richardson, 'Polar Regions,' 1861, p. 304) as distinguishing the Esquimaux; and it may be best given in the words of the first-named of those authorities:—(Οἱ Ἴβηρες οὐ) *πρὸς διαγωγὴν ἀλλὰ μᾶλλον πρὸς ἀνάγκην καὶ ὁρμὴν θηριώδη μετὰ ἔθους φαύλου ζῶσι . . . . εἰ μή τις οἴεται πρὸς διαγωγὴν ζῆν τοὺς οὔρῳ λουομένους ἐν δεξαμεναῖς παλαιουμένῳ καὶ τοὺς ὀδόντας σμηχομένους καὶ αὐτοὺς καὶ τὰς γυναῖκας αὐτῶν, καθάπερ καὶ τοὺς Καντάβρους φασὶ καὶ τοὺς ὁμόρους αὐτοῖς.* The words *ἐν δεξαμεναῖς παλαιουμένῳ* are explained by the information that the 'liquor is kept in tubs in the porches of their huts for use in dressing the deer and seal skins.' It is clear from Catullus's use of the word *mane* (xxxvii) that he did not understand the rationale of the process he refers to, and that he was inaccurate as well as otherwise offensive.

often inwardly bent angle; the outcome of the investigation may be summed up by saying that though lower jaws combining all these marks of degradation may be found amongst such races as the Bushman, the Tasmanian, and the Melanesian, it is only amongst the Eskimos that we find such jaws combined with the widely open orbit and vertically elongated nasal cavity so characteristic of the long-barrow race. And there are many reasons for supposing that the Eskimos are a race which still retains and preserves for us in the structure and grammatical peculiarities of its language, its life-history, and physical peculiarities, the very closest likeness to what we believe some of the earliest races of mankind must have been.

The disproportion which I have dwelt upon (p. 658 *et seqq. supra*) as existing between the male and female limb- and trunk-bones from the long barrows is a striking feature in the comparison of that series with any other from later interments in this country. This however is a skeletal character reproduced in and reproducible by modern savagery. But the 'platycnemy' or peculiar flattening out of the shin-bones, which we know from the researches of Professors Busk and Broca and others to have characterised other early and earlier races of men, has stronger claims to be considered a note of antiquity; it is possible that such tibiæ may be hereafter found amongst modern savages; but they will not, I anticipate, be found amongst such races in the numerical proportion to normal bones which I have found them to possess in neolithic skeletons.

APPENDIX.

I HAVE thought it well to put together in an appendix a few remarks upon the flora and fauna of the prehistoric times with which I have been dealing, with the view of supplementing rather than of summarising the already existing and very extensive literature of this subject. Having had numerous opportunities of examining, not merely the collected contents of barrows, but the barrows themselves whilst still containing them *in situ*, I have come to feel that the history of the prehistoric flora and fauna may have been somewhat analogous to that of the barrows themselves, and may therefore receive some elucidation from it. Firstly, the barrows survive mainly in parts of the country into which agricultural improvements with their levelling tendencies have not penetrated as thoroughly as they have into less rugged, less hilly, more arable districts. But the same causes which have allowed these sometimes large masses to remain undisturbed may be reasonably supposed to have been equally favourable to the living organisms which were their contemporaries. Secondly, when we come to look at the structure of the barrows in various parts of this country and the character of their manufactured contents, we are impressed with the existence in them of a similarity and uniformity the more striking as it is not paralleled by any very marked similarity in the analogous human creations of the present day; whilst it is reproduced more or less closely in the flora and the domesticated fauna of those localities. The sheep, oxen, and swine of the Scotch and Welsh highlands, even if not as closely alike as are the horned cairns of Caithness, of Gloucestershire, and of the Peninsula of Gower (see pp. 536, 537, 702 *supra*), are nevertheless far from dissimilar; vegetable being more dependent upon inorganic influences than animal life, the flora at present in occupation of those districts may perhaps, when we make allowance for very recent disturbances in the way of planting, be held to be even as exact a reproduction of that which occupied them in neolithic times

as the pottery of that period found at one end of this country is of the contemporaneous pottery found in the other. If we are to reason about these as we do about other facts of distribution in space and time, we must hold that a greater uniformity existed in the forms of vegetable and a much greater in the forms of animal life over the whole of this country in prehistoric than in recent times; and that the districts in question may be likened to islands which have been separated from each other by the encroachments, sometimes more, sometimes less gradual, of an invading sea. If a greater mass of material has been available to me in the barrows themselves than has been to some other writers upon the subject of the fauna of prehistoric times, it must be said on the other side that my investigations have been confined to the 'houses of the dead;' and that I am not here writing of the relics to be found in such greater abundance in what were 'the houses of the living,' viz. cave- and pile-dwellings. In the largest long barrow indeed, that at Crosby Garrett (see p. 510 *supra*), which I have examined, I noted that of all the animal bones found, only one single fragment could be said to have been proved to have owed its introduction to the race which reared the barrow. And though in many barrows considerable numbers of such bones have been found, the remains of the funeral feast have not been so productive, as indeed they could not have been expected to be, as the rubbish-pits or the floors of the dwellings of ancient times have been to other investigators.

I. Of the Prehistoric Flora of this Country in the Neolithic Period.

The palæolithic man had before his eyes a country, the hills, valleys, and plains of which had somewhat different contours from those upon which the neolithic man lived his hunting or pastoral life. But the position of the long barrows and forts, reared by the later race of men in places of vantage as regards prospect and elevation, shows us that the solid earth on which they trod has had its escarpments and its river-courses subjected to but little change since their time.

The landscape however upon which his eyes rested was nevertheless a very different one from that which meets ours now in any but the wildest districts of this country. The characters of a landscape at various periods depend mainly upon its vegetation, and if the indigenous trees of Great Britain have not been so entirely out-

numbered and the character of its summer and indeed winter clothing of leaves so entirely changed by foreign immigrations, as Victor Hehn in his interesting work, 'Kulturpflanzen und Hausthiere,' 1870, pp. 2, 314, 392, is inclined to think that of Italy has been, the changes which the woodlands of this country have undergone since prehistoric times have been very great indeed.

Much weight must in the first place be laid upon the enormously greater proportion of the entire surface of the country which was in early times occupied by trees, though England is even at the present day one of the best wooded of civilised countries; for the influence of this quantitative difference upon both man and beast must have been important and many-sided to a degree which, in spite of all that has been written by others, it is difficult to exaggerate. Qualitatively the character of the trees which filled the plains, clothed the hillside, and formed the sky-line of the neolithic period was a very different one from that of those which stand at intervals in our hedges and enclosures and bound our horizon, at least in our midland and southern counties. Some difference of opinion exists among botanists as to whether the 'common' elm, which is now perhaps the most abundant of our southern and midland trees, is or is not indigenous[1]. I cannot but think that the facts of its absence from parts of Great Britain which are separated either by moorland or mountain from the southern and midland counties, whilst it flourishes in such districts when once introduced into them, coupled

[1] For the changes which have been produced in our indigenous flora by the successive immigrants into or conquerors of this country, see De Candolle's Géographie Botanique Raisonnée, 1855, vol. ii. pp. 645–705; the Rev. C. A. Johns, Forest Trees of Great Britain, who says (p. 42), 'If in my history of forest trees I were to confine myself to those which are universally acknowledged to be indigenous to Britain, I should soon bring my labours to a close. England, though once a well-wooded country, never probably could boast of containing within it any great variety of species;' and Pearson, 'Historical Maps of England,' 1869, pp. 48, 49.

For the question as to the indigenous character of the common elm, see De Candolle, *l. c.*, p. 690, and Watson and Bromfield, *citt. in loco;* Pratt, Flowering Plants and Ferns of Great Britain, vol. iii. p. 98; Johns, *l. c.*, p. 227. The history of the common elm, which, though multitudinous and prominent in our landscapes, has yet failed, as its rarely seeding shows, to become really naturalised in our soil, may be taken as corresponding, and curiously, if it be really a Roman importation, to that of the Latin element in our language, which, though outnumbering by mere words the Teutonic or Saxon element in the proportion of 29,354 to 13,330 (Thommerel, *cit.* Max Müller, Lectures on the Science of Language, 1861, p. 74), has never established itself in our grammar. The wych-elm, which in spite of its more rapid growth and greater beauty has nevertheless, owing probably to the lesser durability of its timber, had its area of distribution in Great Britain curtailed by successive invaders, may in like manner be considered to typify the history of the indigenous British races as encroached upon by Teutonic and Scandinavian conquerors.

with the fact of its rarely seeding here, should incline us to the latter view. It is obvious, as has often been suggested, that the Romans who introduced the vine may have introduced with it the 'piller' elm, the two plants being so commonly wedded in Italian husbandry, as in both Italian and English poetry. On the other hand, the readiness with which the wych-elm ripens its seeds, and its power of maintaining itself and flourishing even in the highlands of Scotland, to say nothing of its trivial name, the nationality of which is disputed, would appear to show that it at least is an indigenous tree; and it may consequently have contributed in larger proportions and given *pro tanto* a larger share of beauty to the prehistoric landscape than it does now to ours.

Dwellers on or near the chalk districts of England are too familiar with the conspicuous and beautiful, though common, seedlings of the beech not to feel considerable doubt as to the accuracy of Julius Cæsar's statement that the tree though present in Gaul was wanting in Britain. Antiquaries who are familiar with the fact of the great abundance of the bones of the domestic pig in British barrows, both of the stone and of the bronze age, will find it difficult to believe that, in the latter of those periods at least, beech-mast and beech-trees had not been made available for feeding that animal; especially when they consider how freely intercourse was carried on between Britain and Gaul, and how easily the seeds in question could and would have been carried across the Channel. Botanists at least (see De Candolle, *l. c.*, pp. 154, 689, and Johns, *l. c.*, p. 144) appear to be agreed that the words 'Materia cujusque generis, ut in Gallia, est, *præter fagum* atque abietem' (De Bello Gallico, v. 12) contain one of the few errors fallen into by Cæsar. Had this statement related to Scotland it would probably have been correct, beech-mast never having been found any more than ash-seeds in the peat-mosses of Scotland, though both plants are now to be found even in the extreme north of that country, and though both, I think, must be held to be indigenous in South Britain.

For these considerations and some others seem to me to outweigh the views of Dr. Daubeny, expressed in 'Trees of the Ancients,' 1865, p. 7, to the effect that the beech 'was not known in Holland nor probably in England or Ireland at the time of the Norman Conquest;' views against which, as pointed out by Professor Pearson, *l. c.*, p. 48, the mention of a 'bochholt' in a charter of Offa, and of 'the old beech' in one of the Confessor, can be urged as regards Saxon times. It is difficult also to reconcile them with the general fact stated by

De Candolle, *l. c.*, p. 689, on the authority of Davies (Welsh Botany, p. 90), that *dans le pays de Galles Ffa-wydden* (*wydden étant une désinence commune aux arbres et Ffa le nom proprement dit*) was the name for this tree; or with the special exemplification of this with which the Welsh name for Hereford, a city with beech-trees near it, '*Tre fawydd*,' furnishes us (see Camden's Britannia, p. 476, *cit.* Professor Pearson, *l. c.*). As there is however no question that the beech fails to form any very large proportion of our South Britain peat-mosses, it may be suggested that this transference to the beech by the Welsh of a name which originally belonged to the oak (see Max Müller, Science of Language, ser. ii. p. 236) must have taken place in a country where a preponderance had been gained by the former over the latter tree. If therefore Denmark was the country, see *supra*, p. 631, whence the bronze-importing invaders of this island came, the beech must have been a prominent tree there at an earlier period than is usually supposed[1]. Or it may have abounded here at that time and yet left, as in Denmark, no remains in the uncongenial peat.

[1] As against the prominence, though not against the existence, of the beech in our own country at a much later period might be urged the fact that it is not mentioned by Chaucer in three places, 'The Assembly of Foules' (ed. Bell, 1855, vol. iv. p. 195), 'The Romaunt of the Rose' (vol. vii. p. 59), and 'The Complaint of a Lover's Life' (vol. viii. p. 8), where he does mention nearly all the other trees which in the fourteenth century entered largely into the composition of the English landscape; to wit, the 'oke,' the 'asshe,' the 'elme,' the 'boxe,' the 'firre,' the 'ewe,' the 'aspe,' 'notes,' *s.* 'philbert' (hazel), the 'bolas,' the 'pyn,' the 'maples,' the 'popler,' the 'lyndes,' the 'hauthorne.' And it might be said that in a Welsh poem ascribed to Taliessin, but referred by Professor Pearson (*l. c.* p. 48), to the fourteenth century, the beech and lime are both left unmentioned in describing a battle of the trees; and that the beech is omitted from a much earlier Welsh poem ascribed to Llywarch Hen in the sixth century. See Skene, 'Four Ancient Books of Wales,' i. pp. 279 and 576, *cit.* Pearson, *l. c.* As against the evidence furnished by a fourth passage from Chaucer, 'The Knightes Tale,' vol. i. *ed. cit.* p. 182, in which, as in Spenser's 'Faery Queen,' i. 7, 8, 9, the beech and also the birch and the willow are added to the tree above enumerated, it might be objected that 'the whole description of the funeral and games is taken from the sixth book of the Thebais;' and as a matter of fact we have the words 'gli alti faggi' standing in the parallel passage, 'Teseide,' xi. 22, col. 237, ed. Ven. 1838. But Professor Earle writes to me upon this matter to the following effect: 'In the Knightes Tale, the marshalling of the trees in a catalogue is in manner Chaucer's own; and the majority of the trees, also, are his, and not Boccaccio's. . . . But as far as philological and literary evidence goes, it is all in favour of the trees being at Chaucer's time familiarly English. The word *beech* was ready to hand, and in its final form which has not since been modified. Yet that word was a considerable remove from the Anglo-Saxon *bóc*, and such modification postulates warm and constant usage. The word is ancestral, older, I mean, than our distinct national existence; it is so like in Anglo-Saxon to what it is in Icelandic and in German as to prove that there was no breach of continuity in its use from the earliest time.'

By the word 'abietem' Julius meant probably the *Abies pectinata*, s. *Pinus picea* L., our 'silver fir,' a tree with which, as being a Swiss, a French, and a Pyrenean pine, and climbing those heights in company with the beech, his campaigns in Western Europe had sufficiently familiarised him. The Scotch fir, *Pinus sylvestris*, was for many centuries later the only representative in these islands of the *Abietineæ*, and indeed the yew, *Taxus baccata*, and the juniper, *Juniperus communis*, the only other representatives of the entire natural order *Coniferæ*[1].

In a round barrow at Kepwick examined by Canon Greenwell (see *supra* p. 337) and myself the grave was found lined with the bark and branches of the birch; much as the Lapp graves, described in the Compte Rendu of the Stockholm International Congress of Anthropology, 1876, tom. i. p. 181, or Mestorf's Report of it, 1874, p. 13, contained bodies entirely covered with several layers of birch bark sewed round them to protect them as much as possible. It is interesting to add that in these tombs, constructed of stones and with much pains, 'on y a retrouvé . . . des pointes de flèche et des cuillers en bois de renne ainsi que des fragments de poterie . . . .' and that 'quelques-uns de tombeaux renfermaient une ou deux pièces de bronze et de fer.'

Herr Victor Hehn has in two passages, *l.c.* pp. 11 and 425, laid so much weight upon the importance of the lime or linden tree (the 'lyndes faire' of Chaucer, *Tilia europæa*, *grandifolia*, and *parvifolia* of botanists) to man in early stages of culture, at once for the manufacture of matting, an invention of older date than weaving, and for the

[1] The Scotch fir, *P. sylvestris*, must have met Cæsar's eyes in great abundance in the parts of Britain which he traversed. Still he, not being a botanist, may have failed to recognise it as an *abies*; and it may, in the other countries in which he might have seen it, have been, then as now, overgrown and obscured by its natural allies. Or indeed it may have been represented in those regions at that time only by that dwarf marsh-haunting variety which, following zoological analogies, I would call *P. sylvestris*, var. *palustris*. The Swiss spruce, *P. abies*, on the other hand, which as much excels our English spruce in size and beauty as our Scotch fir excels the Swiss, may very easily have been confounded with the silver fir, *P. picea*, by Cæsar, as when old it comes to resemble it both in general *facies* and in the colour of its bark. I have thought that the spruce may, like our common elm, have attained its present numerical preponderance in recent times and owing to man's help and its superior serviceability. And Dr. Uhlmann tells me it is less abundantly represented in the stone-period lake-dwelling of Münchenbuchsee than the silver fir. Dr. H. Christ, on the other hand, says the reverse is the case in the station of Robenhausen, which, according to Rütimeyer, Fauna der Pfahlbauten, p. 161, bears other evidence of belonging to a later 'Kulturzustand.' For the geographical distribution of the *Abietineæ*, see De Candolle, *l.c.*, pp. 158, 190, 192; Fischer, Flora von Bern, 1863, pp. 227, 228; Heer in Keller, ed. Lee, p. 349; Dr. Christ in Rütimeyer, *l.c.*, pp. 228, 229.

supply of honey to bees, to say nothing of its other uses, that in view of the indigenous character of the tree being disputed it becomes of importance to note that De Candolle (*l. c.* p. 658), with the arguments of Messrs. Leighton and Bromfield and with the philological evidence furnished by Davies (Welsh Botany, p. 53) before him, inclines to the affirmative side of the question. As regards the small-leaved lime-tree, *Tilia parvifolia*, the claims of which to be considered indigenous Mr. H. C. Watson (Cybele, i. p. 243) allows, it may be added that Mr. Edwin Lees (*cit.* Johns, *l. c.* p. 260) informs us that there is in the neighbourhood of Worcester a wood remote from any old dwelling or public road, of about 500 acres in extent, the greater part of which is composed of the small-leaved lime.

II. Of the Prehistoric Fauna of Neolithic Times.

But though the lime may have been available in these islands for the use of the bee, and though both the laws (Wotton, Leg. Wallicæ, i. 22. p. 43) and the literature (Sharon Turner, Vindication of the Ancient British Poems, p. 59; Stephens, Literature of the Kymry, 2nd ed., 1876, p. 80) no less than the reputation (Holinshed, England, ed. 1807, i. 286) of the Welsh tell us that they made 'no less accompt' of metheglin or mead 'than the Greeks did of their ambrosia or nectar,' I should for several reasons be slow to think that the bee was domesticated in this country before the Roman era, or that the Celtic mead was made of any but wild honey. If we consider however, firstly, that even to the Romans themselves sugar was mainly procured from honey, beet-root and maple-sugar being wholly unknown and cane-sugar having been heard of only in some tradition from the expedition of Nearchus (Strabo, xv. 1. 20); and, secondly, how largely now separated sugars[1] enter into the dietaries even of the poorest amongst us, we shall

[1] See address to the Physiological Subsection of the British Association, by Edward Smith, M.D., F.R.S. Report, Bath Meeting, 1864, p. 110. 'Separated sugars were obtained by 98 per cent. of the farm labourers in England, 92 per cent. in Wales, 96 per cent. in Scotland, and 82 per cent. in Ireland; and the quantity per adult weekly was—England 7½ ozs., Wales 7¾ ozs., Scotland 5¾ ozs., and Ireland 4¾ ozs.; so that Wales occupied the head, and Ireland the foot of the list, both in frequency and quantity. Of in-door operatives, silk-weavers obtained 7½ ozs., needle-women 7¼ ozs., kid-glovers 4¼ ozs., shoemakers 10 ozs., and stocking-weavers 11 ozs.; and hence the average was higher than that of out-door labourers, as 8 ozs. to 6·6 ozs. The frequency with which they were obtained was the same in both classes on the whole average.'

come to see that this at first sight trifling matter would, if we could transport ourselves back into the days of even Caractacus, constitute for us as constantly felt a difference between ancient and modern life as would the absence or extreme rarity of glass and coal. The only evidence which I have met with which may seem to show that the British in pre-Roman times obtained the honey which the authority I am about to quote calls an 'excellent succedaneum' for sugar, from hived bees rather than πέτρης ἐκ γλαφυρῆς of the Iliad (β. 88), the 'stony rock' of Scripture[1], or the mountain oak of Hesiod's Works and Days, 230, is the following passage in Mr. Logan's 'Scottish Gael,' ii. 147. 'The Celtic Britons,' says this authority, 'kept their bees in a bascaud formed of willow plaited. About fifty years ago one of these was found in Lanishaw Moss; and about eighteen years since another was discovered about six feet underground in Chat's Moss, both in Lancashire. This last was a cone of about two yards and a half high and one yard in diameter at bottom, and was divided into four floors or separate hives.' No references are given *in loco*, and I have not been able to find any more detailed account of this discovery elsewhere. The older editions of Sir Charles Lyell's 'Principles of Geology,' e.g. ninth edition, 1853, chap. xlv. p. 721, familiarised us with the belief that Roman roads were to be found in Yorkshire and Kincardineshire covered under peat of eight feet in thickness; but in his tenth edition of 1868, vol. ii. chap. xliv. p. 499, as also in his 'Antiquity of Man,' 1863, p. 110, we find some distrust expressed upon this point, and in the last cited work the author inclines to accept M. Boucher de Perthes' estimate of three centimètres being the

[1] I have not been able to convince myself that there is any allusion in either the Old Testament or the Homeric poems to the invention of the hive any more than there is to the common fowl. The earliest mention of hives which I have met with is in Hesiod (fl. 700 B.C.), who in five lines of the Theogonia, 594–598, speaks of them twice, once in the words σμήνεσσι κατηρεφέεσσι, and again as ἐπηρεφέας σίμβλους. An eminent scholar has however suggested to me that hives seem to be referred to in the words from the description of the cave in Ithaca (Odyssey, ν. xiii. 106):—

ἔνθα δ' ἔπειτα τιθαιβώσσουσι μέλισσαι.

But nothing that I can find recorded of the habits of wild bees is inconsistent with what we can see of the fearlessness with which swarms of our bees will enter places tenanted by man. As regards the force of the words, I find that Virgil in his paraphrase of the passage Æneid, i. 159 *seqq.*, as also Quintus Calaber in his vi. 470, omit to give any equivalent whatever for them, whence perhaps we may infer that they were not quite certain what they meant. Mr. Worsley however, in his translation of them, gives us the simple words, '*Wild* bees make honey there.' The two passages in the Iliad, β. ii. 87-89, μ. xii. 167, obviously refer to wild bees; and I submit that Quintus Calaber in his line iii. 222, αἵ ῥά θ' ἐὸν περὶ σίμβλον ἀπειρέσιαι ποτέονται, as well as elsewhere, was guilty of an anachronism.

rate of increment for every hundred years. The following summary, however, of the facts known as to the growth of peat, given by Professor McK. Hughes in a lecture given before the Royal Institution, Friday, March 24, 1876, on 'Geological Measures of Time' (see Proceedings of the Royal Institution, p. 6), will justify us in setting aside the imperfectly recorded history given above from Mr. Logan's work:—

'He explained the growth of peat, pointing out that there are two kinds of peat; that which is formed in water, as in mountain tarns or old river-courses, and the peat that grows all over the slopes of moorlands, high and low. The first is partly formed from drifted vegetable matter in the deeper parts, and from the decay of plants that grow on the spot all round the margin, which therefore encroaches rapidly. Here at the outset we meet with a source of error. The rate is very different in these two cases, the quantity of vegetable matter that drifts far in being generally very small. On the hill-sides the growth is to be referred almost entirely to two or three species of moss, and in a smaller degree to the heather and other plants. As the lower part of the mosses *sphagnum* and *hypnum* decay away and add to the layer of peat below, the upper part grows on, and so a thick layer of vegetable matter is at length accumulated. Workmen tell us that when they have dug a trench into a peat-moss, if they leave it alone it fills up again, or, as they would say, the peat grows again. This happens when the peat is apt during some seasons to be full of water, so as to become a kind of slush or ooze. It is perfectly clear that the apparent rate of accumulation where such filling in occurs must often be deceptive. A good example of a similar thing happening on a large scale in nature is the case of the Solway Moss, and many other instances as recorded by Lyell.

'So we see that while the peat is being formed it is subject to all kinds of variations, and when it has been formed it is liable to be soaked with water and run, destroying the value of all evidence to be derived from any observation on its rate of growth elsewhere.'

On the other hand, my own excavations in Roman rubbish-pits have furnished me with something of an argument to set against the reported discovery of hives under peat. When excavating in 1868 (see Archæologia, xlii. p. 476) a very large pit of that kind at Frilford, I was much struck with the relatively great abundance amongst the various kinds of earthen vessels there represented by

larger or smaller fragments of small, often nearly perfect, pots of hard black ware of about the size of a large swan's egg, with the smaller end truncated and flattened and the larger usually provided with a recurved lip for tieing a cover over its contents. Now I have never found any of the various and well-known varieties of Roman funeral ware in a Roman rubbish-heap; every article of daily life, of the coarsest and of the finest kind, whether in pottery or metal, may be found in such deposits; but within my experience they never contain anything which was destined for the tomb or could bring to mind the *invisas cupressos*. It is obvious however that such jars might be supposed to be intended for the cosmetic rather than the culinary needs of the luxurious Romans. But for the purposes indicated by Horace (Od. iii. 29) and Persius (Sat. iv. 37), for the *balanus capillis* and the *balanatum gausape*, finer ware than that of these diminutive amphoræ would, I think, have been used, for finer ware is usually present in abundance in such collections, and was, as I have noted, *l. c.*, specially abundant in the case specified; whilst, as was pointed out to me by Mr. Wm. Hatchett Jackson, of the University Museum, small jars of much the same contour, if not of the same paste, are still largely used in the honey trade of Narbonne. The sale of honey was amongst the *patrias artes* of the Ligurian of the times of Diodorus and Strabo[1], and fashions and

[1] Diodorus (v. 34) writes thus of the Celtiberians (in the connection already referred to, p. 635 *supra*): Τροφαῖς δὲ χρῶνται κρέασι παντοδαποῖς καὶ δαψιλέσι καὶ οἰνομέλιτος πόματι, χορηγούσης τῆς χώρας τὸ μέλι παμπληθές. It may be an overstraining of the words to suggest that the six last quoted may be considered to indicate that *wild* rather than hive honey was in the mind of the writer. The words of his contemporary Strabo are in a parallel passage (iv. 6, 2, p. 168, ed. Müller, 1853) to the following effect:— Λίγυες, ζῶντες ἀπὸ θρεμμάτων τὸ πλέον καὶ γάλακτος καὶ κριθίνου πόματος, νεμόμενοι τά τε πρὸς θαλάττῃ, χωρία καὶ τὸ πλέον τὰ ὄρη . . ὕλην παμπόλλην ναυπηγήσιμον καὶ μεγαλόδενδρον . . . κατάγουσιν εἰς τὸ ἐμπόριον τὴν Τένουαν καὶ θρέμματα καὶ δέρματα καὶ μέλι . . . . πλεονάζει δὲ καὶ τὸ λιγγούριον παρ' αὐτοῖς ὅ τινες ἤλεκρον προσαγορεύουσι.

M. Escher vom Berg, Mittheil. Ant. Gesell. Zurich, Rapp. vi. Pfahlbauten, p. 34, suggests that the straining of honey off the comb may have been the use to which such perforated dishes as that figured by Keller, *l. c.*, taf. v. fig. 26, p. 270, or ed. Lee, pl. lii. B, fig. 1. See also Désor, Le Bel Age du Bronze, p. 12, fig. 22, and Schliemann, Trojanische Alterthümer, tab. 174, fig. 3377. Usually such perforations are held to have been intended for filtering whey off curds, in accordance with the Homeric words, Od. ix. 222, 223:—

Ναΐον δ' ὀρῷ ἄγγεα πάντα
Γαυλοί τε σκαφίδες τε τετυγμένα.

But, as hinted above, p. 705, we may suppose that in such descriptions as this we have traditions of a much earlier period than those we are here concerned with, preserved for us. It is right however to add that Herr Edmund v. Fellenberg, Bericht über die Pfahlbauten des Bielersees, S. A. 1875, pp. 55-61, suggests yet another application, that of fumigation, for these vessels. Honey however is so strained in certain Swiss valleys at the present day.

patterns which have once been in vogue in such trades are often very persistent.

Strong evidence of the literary and historical kind (*q. v.*) is brought forward by Mr. J. Thrupp, in his interesting article on the 'Domestication of Animals in England' (Trans. Ethn. Soc. London, 1865, New Series, vol. iv. p. 169), in favour of the conclusion that 'in the sixth and seventh centuries bees were altogether wild' in this country. The history of the words used for 'hive' appears to show that the first step towards the domestication of the bee by the English was 'the formation of imitations in bark (*rusca*, see Ducange, *sub voc.*) of the hollows of the trees in which they were found.' About the middle of the tenth century we read of Anglo-Saxon 'beo-churls;' and we find 'the Anglo-Saxon word "beo-cist" (bee-chest) and the Latin "alvearia" (bee-hives) usually substituted for "rusca," from which it may be inferred that these rough constructions were superseded by regular hives.'

Hehn (Cultur-Planzen und Hausthiere, p. 425 ed. i. p. 505 ed. ii), referring to an 'erschöpfend' article by Pott in Kuhn and Schleicher's Beiträge, ii. 265, in which the Slavonic word for hive is stated to be *ulei* and the Lithuanian *awilys* (as according to Grimm (1819) the Bohemian word is *aul* and the Polish *ul*), suggests that these words may be loan words modelled from the Latin *alveus*, and mediæval Latin *apile*. The Welsh scholars in Oxford, the late Principal of Jesus College and Professor Rhys, inform me that the common Welsh word for beehive is *cwch-gwenyn*, literally boat of bees, and that these are not loan words. If the words are not borrowed words, the idea which they express is borrowed, and shows that the employers of the metaphor used boats before hives. If the boats to which they compared the beehives were the North Welsh coracles with 'subspheroidal' rather than so-called 'scaphoid' outlines, this may further indicate that the earliest form of beehive with which the Welsh were acquainted was one which was late to be attained to in the development of the invention[1]. If we are right in holding, on the authority of Logan, *l. c.*, that the Cornish word for hive is *kauelh*, which in Welsh means a large basket, this would go some way to show that the Cornish were not acquainted with, or at least did not adopt the hive until it had been developed beyond

[1] I learn from Professor Westwood that according to Spinola our domestic species *Apis mellifica* rarely occurs in Liguria; and he suggests that this shows either that the Ligures were not the colonisers of Wales, as has been affirmed, or that they did not bring their bee *Apis ligustica* with them.

the stage of 'rusca,' 'corticibus suta cavatis,' into that of the 'lento alvearia vimine texta' of Virgil. I have, finally, the authority of Professor Rhys for the possibility of the Welsh word for wax, viz. *cwyr*, being a loan word from the Latin.

I searched, as I had expected, in vain, for any figure of a hive in Mr. Evans's [1] 'Coins of the Ancient Britons,' 1864.

The currently, and as I believe correctly, accepted view that the common fowl, *Gallus gallinaceus*, is never mentioned by, and may with some considerable likelihood be supposed to have been unknown to the Old Testament writers and to Homer and Hesiod also, is confirmed by the negative evidence of the neolithic interments in this country [2].

[1] In answer to an enquiry of mine as to the existence of a figure of a hive on any ancient coin whatever, Mr. Evans informs me that he does not know of any such coin which has certainly a hive upon it. The figures upon two coins of Dyrrachium given by Beger (Thesaur. Brandenberg. Select. vol. i. p. 459) and by Goltz (ed. Nonnius, 1620, pl. i. fig. 7, p. 4) amongst the coins of Greece, the Islands, and Asia Minor, though described *locc. citt.* as '*apiaria*' and '*alvearia*,' Mr. Evans thinks may be merely the caps of the Dioscuri. And to me these figures, as given in the latter of the books referred to, appear with their pendent strings to suggest the *mitræ* with *redimicula* of the Æneid, ix. 616, rather than the *alvearia* of the Georgics.

Professor Westwood has furnished me with certain references from hagiological literature which bear on the question of the recent date of the domestication of the bee in these islands. In the Life of St. Cadoc (Bibl. Cotton. Vesp. A. xiv) it is stated that he chose a solitary place for his monastery, having seen *aprum sub arbore jacentem, apes venientes et intrantes in cavam arborem.* In the first Life of St. David we are told that his father was told by an angel that he would find gifts by the river Teivy; a certain stag; *apumque examen in arbore positum*, &c. And in the second Life of the same saint there is a curious legend of a swarm of bees settling on a ship going to Ireland, the bees following St. David from place to place; and it is added that '*Hibernia in qua nunquam usque ad illud tempus apes vivere poterant mellis fertilitate ditatur.*' See also Lanigan, Eccl. Hist., iii. 82-84; Life of St. Molaga, cap. 22; Notes on Irish Architecture, by the Earl of Dunraven, i. pp. 63, 64.

[2] It is a little difficult to reconcile the passages which stand in our authorised version of the Old Testament (1 Kings x. 22; 2 Chron. ix. 21), to the effect that a navy of Tarshish brought 'once in three years gold and silver, ivory, and apes and peacocks' to king Solomon, with the view held, I should suppose, by most modern Hebraists, as by Bochart (Hierozoicon, ed. 1682, lib. i. cap. xvi. p. 111), that when the Latin 'interpretes multa prophetarum loca ad gallinaceum genus referunt,' it is, in the words of the writer just cited, *conjecturis non satis certis.* For the servants of Hiram and Solomon would have found it at least as easy and profitable to import *Gallus bankiva* and indeed *Sus indicus* as apes and peacocks. But as against this utilitarian consideration we may suggest that the words of Cæsar quoted in the text render it not wholly improbable that to the Tyrian sailors the fowl may have been a forbidden food, as it was to many other races; and as, in fact, *Sus* was to their Hebrew comrades on those ships of Tarshish. Antiquaries who hold that it was from intercourse with Phœnician rather than with Etruscan traders that the Britons learnt certain other things will think this an argument in their favour. A long sea-voyage however, as the absence of the fowl from New Zealand in the time of Captain Cook shows us, made the introduction of domestic animals very difficult to such navigators. And the history of the words makes me suspect that it was by the way of Babylon rather than that of the Red Sea that the peacock itself, to say nothing of the common fowl, the *περσικὸς ὄρνις*, found its main route of immigration into Palestine and Greece. For, during the

Negative evidence is perhaps stronger in this case than in most of the others in which I have had to refer to it. For it is difficult

Babylonish captivity the word *tukhi-im*, the Hebrew representative of the Malabar name for the peacock, had become obsolete, and, like many other Hebrew words, was nearly forgotten in the time of the LXX, who have given what the Targum, using a word, *tavass*, almost identical with *ταῶς*, holds to be its true meaning, only once and in a various reading (Cod. Alex.), *καὶ ταώνων*. And Minayeff (*cit.* Caldwell, Dravidian Grammar, ed. 1875, p. 92) has discovered in the Buddhistical writings that the ancient Indian merchants took peacocks to Babylon. Probably the fowl was carried with them.

As regards the absence of any mention of the common fowl in the Homeric poems, I have been told that an eminent and voluminous writer upon this subject is of opinion that in the line, Il. ζ. (vi.) 513,

Τεύχεσι παμφαίνων, ὥς τ' ἠλέκτωρ, ἐβεβήκει,

we have Paris, in his ill-supported character of warrior, compared to this bird. A somewhat similar passage in the Proverbs of Solomon (xxx. 31) has been similarly misconceived of; and it is true that we do find this comparison used by Æschylus (Agamemnon, 1671) for a man with a character not wholly unlike that of Paris. This however proves nothing. I have not enquired what the balance of commentatorial authority may be upon this point; for I cannot understand how any unprejudiced person who will compare the passage already referred to, Il. vi. 504–514, with the ten lines Il. χ. (xxii.) 22–32, describing the armed Achilles, can doubt that the two passages are the work of one poet; that he uses in them two metaphors in illustration of one phenomenon; and that in neither of these metaphors is the bird in question alluded to. Theognis (fl. 540 B.C.) is the earliest Western writer, so far as I know, in whom any indisputable allusion to this bird has been found; and to him the cock-crowing appears to have become already a familiar mark of the passing of time. We have also Payne Knight's authority (Prolegomena, ed. 1820, Paris and Strasburg, p. 3) for saying that in the same sixth century B.C. the coins of Himera and Samothrace bore evidence of its establishment in Mediterranean countries. See for coins, Goltz and Nonnius, Græcia, Insulæ et Asia Minor; Carystus, tab. xi. et xii.; Massieu, p. 500; Rasche, Lex Numn. ii. 2. p. 311.

Whilst upon the subject of the importation of animals from the East Indies, I would draw attention to the fact that the area of the world's surface which M. Mortillet (in his most suggestive paper, 'Sur l'Origine de Bronze,' in the Révue d'Anthropologie, 1875, iv. p. 653) has pointed out as the region in which the largest and most readily available deposits of tin were and are to be found side by side with copper, the region namely which extends from 'La Birmanie Anglaise' to the Sunda Straits, lies entirely within the area of distribution of the *Gallus bankiva* (see Sclater, Proc. Zool. Soc., April 21, 1863, p. 122), the undoubted parent stock of the common fowl. This coincidence appears to me to add something to the force of M. Mortillet's argument in favour of the East Indian origin of bronze; but it must be added, on the other side, that if the domesticated bird followed bronze westwards, this order of events was reversed in the easterly and south-easterly direction, the introduction of the bird having preceded all importation of metal into Polynesia.

So much has of late been written upon the Indian or African origin of our domestic animals, mammalian and avian, that it may be well to add in this connection that too much weight may in this question be given to the principle laid down by Link in his usually excellent though now old treatise, Die Urwelt, 1821, i. p. 201, to the effect that the domestication of birds indicates a higher condition of civilisation than the domestication of mammals. The Indians described by Mr. Bates (*l. c. supra*) domesticate not only the common fowl which will, but curassows which will not breed in captivity; and the same authority is referred to by Mr. Francis Galton (Trans. Ethn. Soc., 1865, New Series, vol. iii. p. 125) as having given him a list of birds tamed by the same tribes which is more extensive than the list of quadrupeds tamed by them, though that list contains twenty-one species. And this they do, at the same time that they 'do not

to think on the one hand as regards literature, that poetical writers would have omitted to use for illustration the habits and bearing and peculiarities of a creature which all later poets, gnomic and other, have so constantly and multifariously alluded to; and on the other as regards excavations, that an animal which Captain Cook found in occupation of Polynesia, from Tahiti to the Sandwich Islands, and which has since been adopted everywhere, even by the non-progressive Indians of the Amazons (see Bates, *l. c.*, ii. 193), and 'by remote tribes on rivers rarely visited by white men,' would have been missing in them if it had existed on the spots at the period concerned. There is of course no question that the common fowl was known to if not used by the Britons when Cæsar made his short acquaintance with them and found that 'Leporem et gallinam et anserem gustare fas non putant; hæc tamen alunt animi voluptatisque caussa.' (See De Bello Gallico, v. 12.)

Nor, on the other hand, does the discovery of the bones of *Gallus* as described by Alphonse Milne Edwards (Reliquiæ Aquitanicæ, p. 241) in association with 'those of Ursus spelæus, Rhinoceros, and large Felis' in the caves tenanted by palæolithic man make it at all more likely that the bird has, any more than the mammals, been continuously represented upon that area since those times down to those of Cæsar and ours. The struggle for existence with rival animals, to say nothing of that to be waged against inorganic forces, may well have exiled and exterminated during the neolithic age animals which the men of the bronze and iron have found it their pleasure or their interest to introduce again, or which may themselves have succeeded in reoccupying their lost territories. The history of the fallow deer, and possibly those of the rabbit and horse, might, if we could read them out of the records in the soil, illustrate this principle, just as the recent history of the capercailzie, *Tetrao urogallus*, does.

On the other hand, though M. Alphonse Milne Edwards (*l. c.*, pp. 243–247) appears to think otherwise, I should incline to think the Crane, *Grus cinereus*, may have occupied this country con-

show themselves so sensible of the advantages derivable from the ox, sheep, and hog, all of which have been introduced into their country.' Few Englishmen will be found to agree in Guizot's comparison (Hist. Civ. Franc., lect. vii. tom. i., *cit.* Merivale, Conversion of the Northern Nations, p. 185) of their Anglo-Saxon forefathers' condition, social and political, to that of the modern Red Indians; still as against Link's principle quoted above it is worth while to recollect that they, in the words of Mr. Thrupp (*l. c.* p. 172), 'kept as pets and probably attempted to domesticate' ravens, rooks, cranes, and peacocks.

tinuously from palæolithic down to the comparatively recent period of its extinction here. Difference merely of size is not sufficient in this case to establish a specific difference. The bones of more than one specimen of this bird were found by two of my former pupils, Mr. W. Bruce Clark and Mr. Randal Johnson of Pembroke College, in a rubbish-pit at Wytham, near Oxford, mixed up with the skeletons of three dogs, with bones of ox, pig, roe, horse, teal and wild-swan, and with coarse culinary nail-marked and other British pottery, by which the date of this 'find' is fixed to the bronze age. I have not met with any remains of this bird in any excavations of an earlier date in this country; though it is difficult to think that neolithic man would have neglected it as an article of diet unless debarred by superstition from making use of it.

The rabbit, *Lepus cuniculus*, finds a place in several catalogues of British Prehistoric Mammalia; Mr. Pengelly, however, writing of the discovery of the cave man at Mentone (Trans. Devon Association for the Advancement of Science, vi. 1874, pp. 318, 801, 818 and 840), says that the discovery of its bones in that deposit does 'not strengthen the evidence for its antiquity:' though there is of course no doubt that the remains of this animal, which still survives as a member of the fauna of North Africa, form an essential and not merely an accidental constituent in the quaternary deposits of Mediterranean caves (see Prof. Busk, Zool. Trans. x. 2, p. 128), and though it is difficult to set aside the evidence of their holding a similar relation to some of our own caves. Professor Rogers, who in his 'History of Agriculture and Prices in England' has given us (vol. i. pp. 33, 65, 123, 340, 341, 583, vol. ii. 558–9[1]) records of the high prices paid for these

[1] In Daniel's 'Rural Sports,' 1801, vol. i. p. 347, there is the following statement:—'In an account of the prices of provisions, &c. at the installation feast of Ralph de Borne, abbot of St. Austin's, Canterbury, A. D. 1309 (contained in the fourth volume of Dr. Henry's valuable History of Great Britain), we have among others the following articles:—

	£	s.	d.
600 rabbits	15	0	0
Partridges, mallards, bitterns, larks . .	18	0	0
200 pigs	5	0	0

As partridges are here associated with other birds and no mention made of their number, their price in these times cannot be ascertained, but a rabbit appears to have been sold at the same price as a *pig*, viz. *sixpence* each. Their relative value has considerably altered in the interval between that day and this.'

I should not agree with the view put forward (*l. c.* 341) by my friend and former tutor Professor Rogers, to the effect that rabbits when once introduced 'would spread very slowly over the country.' We have good natural history evidence, both direct and analogical, for holding that starting even from a single centre, and as individuals

animals in the middle ages, declares himself of opinion that 'rabbits were introduced into England in or just before the thirteenth century.'

I have never found the remains of the rabbit in any surroundings earlier than those of Saxon times; but difficult as it may be to prove the positive fact of the contemporaneity of a burrowing animal with a deposit into which it is possible it may have burrowed, it is more difficult still to prove the negative fact of its absence from an entire country at any one particular period. Further, the comparatively small size of the rabbit makes the matter still more difficult than it is as regards the fallow deer, or the elm and vine and chestnut, which we may speak of as having been probably introduced or reintroduced by the Romans. And, thirdly, as a much larger portion of Britain was occupied in earlier than in later times by woodland which would furnish protection and harbour to the *mustelidæ*, the martens, weasel, stoat, and polecat, the natural enemies and most effectual destroyers of the rabbit, we can understand how this latter animal has escaped the ordinary fate of *feræ naturæ* and become more abundant in this country concomitantly with the increase of its human occupants, and the curtailment of its woods and forests[1]. The re-

ranging only for short distances, they would form a circle with a very rapidly widening circumference *in the absence or paucity of natural enemies*. Literary evidence in the same direction is furnished by the beautiful lines of our fourteenth-century poet, Chaucer, in the 'Romaunt of the Rose,' ed. Bell, 1855, vol. vii. p. 60:—

'Conies there were also playing
That comen out of her claperes,
Of sondry coloures and maneres,
And maden many a turneying
Upon the freshe gras sprynging.'

So also in the 'Assembly of Foules,' vol. iv. p. 196, in a parallel passage of equal beauty we have the line

'The pretty conies to hir playe gan hie.'

Whence it would appear that the animal in question was a familiar object to English eyes in those days. I take this opportunity of remarking that an acquaintance with the line next but one to that just quoted,

'The dredeful roe, the buck, the hart, the hind,'

would have made the suggestion that the fallow deer was introduced into England no earlier than the time of James I. an impossibility. For the introduction of the fallow deer into Britain, see Professor Boyd Dawkins, Proc. Geol. Soc. Lond., June 17, 1868, p. 515; 'Nature,' Dec. 10, 1874, Jan. 21, 1875; Jeitteles, *ibid.*, Nov. 26, 1874; Sir V. Brooke, *ibid.*, Jan. 14, 1875.

[1] From British coins the rabbit is as entirely absent as is the beehive; see p. 729 *supra*. Of Spanishcoins, on the ot her hand, Spanheim (De Præstantia et Usu, vol. i. p. 179), in a passage pointed out to me by Mr. Evans, says it may be taken '*index velut ac tessera*,' much as the dolphin is of Italian seaports and the owl of Athens and her colonies. Dr. Whitaker however, in his 'History of Manchester,' may overstrain the

lations of the *Mustelidæ* to the *Rodentia* generally, are expressed accurately in the Batrachomyomachia, 51–52:—

πλεῖστον δὴ γαλέην περιδείδια ἥτις ἀρίστη
Ἣ καὶ τρωγλοδύνοντα κατὰ τρώγλην ἐρεείνει.

The bones of water-rats, *Arvicola amphibius*, I have found lying in great quantities in a barrow together with a few remains of the polecat, *Mustela putorius*, which latter animal had used the place as a lair and probably nest for a considerable period. The upper and lower jaws of the water-rats had been left intact, their strong teeth, which should have prevented what I am well assured were similar remains in other barrows from being spoken of as 'rats' bones, having been found over-resistent by their destroyers, who had however, with the characteristic instinct of their genus, never spared the brain-containing calvariæ.

The dog has only rarely been met with in British interments either of the stone or of the bronze age, a circumstance worthy of note when we recollect how very commonly the dog has in all countries kept his master or mistress company in the tomb as faithfully as during life. One instance however of such an interment I noted and have described (Journal Anth. Inst., v. p. 157; see p. 517 *supra*) in the neolithic barrow at Eyford; the dog had undoubtedly been buried together with a woman, whose skeleton was, like that of the dog, still partly *in situ*. The characters of the dog's skeleton, like those of many other objects found even in interments most undoubtedly of the stone- and bone-age, are such as, irrespective of any reference to what we know of palæolithic times, to impress upon us the conviction that the men even of those far-off days had yet been preceded by many generations who had made weapons and domesticated animals. This dog bears no resemblance to the wolf-like Esquimaux dog on the one side, nor to any such small terrier-like breed on the other, as might suggest that it represents a lately domesticated jackal. It may be conveniently spoken of, as Rütimeyer (Fauna der Pfahlbauten, p. 118) does speak of the dog, similarly rare in the relics from the Swiss lake-dwellings, as a 'middle sized' dog, 'einen Hand von mittlerer

words of Varro (iii. 12), 'Et quod in Hispania annis ita fuisti multis ut inde te cuniculos persecutos credam,' by supposing them to show that the writer held that all rabbits in Italy had been imported from Spain. For a disquisition on the history of the rabbit, see Houghton, Ann. and Mag. Nat. Hist., 1869, iv. Ser., vol. xv. p. 179. For one on that of the martens, see Cambridge Journal of Anatomy and Physiology, 1868, pp. 47, 62, 437, 438, where the historical relations of these animals to the rabbit, and also to the *Felis catus*, are considered.

Grösse;' a description which, however vague, is decisive as to its representing a long-domesticated breed. The lower jaw, the only part of the head which had been left undisturbed *in situ*, had the stoutness and was about the size of that bone as seen in some of the smaller English mastiffs; its trunk bones are still incomplete, but may be supposed to have made up the framework of a body about the size of that of an ordinary shepherd's-dog[1]. The dogs of the bronze period referred to, *supra* p. 732, are about the same size.

In the same chamber with the bones of this dog a single bone of a fox, *Canis vulpes*, was found, which escaped notice when the contents of the chamber were first examined and described, *l. c.* Its texture and weathering are so similar to those of the other bones, human and canine, found in the chamber, as to suggest that it must have been nearly or quite of the same age; and its slenderness and slightness, as compared with those of modern foxes, illustrate the principle that the bones of the carnivora of times when game-preserving was unknown, and when they had consequently more of their own congeners to compete with and fewer of their victims available to prey upon, are smaller than those of our days when these conditions are exactly reversed. The bones of the martens and polecats which I have found in various barrows bear out this view. Similar facts have been noted by Rütimeyer in the 'Fauna der Pfahlbauten,' p. 231.

As in the earlier pile-dwellings of Switzerland, so in the stone-age barrows of this country, the horse is less frequently found than from what we know of the discovery of its bones in cave-dwellings on the one hand, and in interments of later date than the stone age on the other, we should be inclined to expect[2]. I have never found the bones or teeth of a horse in a long barrow, and I would remark that, whilst such bones are very likely to be introduced into such barrows in the way of secondary interments, I have not met with

[1] The dog was abundantly represented in the Norfolk flint mines known as 'Grimes Graves,' and described by Canon Greenwell, Journal Ethnol. Soc. 1870, p. 431. I do not know the size of the animals to which these remains belonged, but the ingenious argument which Rütimeyer has drawn from the supposedly uniform inferiority in size of the stone-age dog for the singleness of race of his human masters is invalidated by the discovery in the very early lake-dwelling of Luscherz by Dr. Studer of more than one race of dogs. See Bericht über die Pfahlbauten des Bielersees, 1875, p. 24.

[2] For the history of the prehistoric horse, see Rütimeyer, Fauna der Pfahlbauten, 1861, p. 122; Archiv für Anthrop., 1873, vi. p. 60; 1875, viii. p. 125; Veranderungen Unserer Thierwelt, 1876, pp. 69, 92; Naumann, Archiv für Anthrop., 1875, viii. p. 12; Merk, Excavations at the Kesserloch, translated by J. E. Lee, 1876, pp. 9, 47, with figure; Dupont, Congrés Internat. Stockholm, C. R. 821; Kinberg, *ibid.*, p. 830.

any exact record as to the finding of them in surroundings which left no doubt as to their being contemporaneous with the primary interments. The bones of the horse are both durable and conspicuous, and it is difficult to think that if the neolithic man had used the animal either for purposes of food or for those of carriage, as his predecessors and successors did, we should not have come upon abundant and unambiguous evidence of such use.

As regards the wild boar, *Sus scrofa*, var. *ferus*, I have to say that in this country, whatever has been the case elsewhere, it has been but rarely found in the barrows either of the bronze or of the stone period. Until indeed the discovery of it at Cissbury, as described in the Journal Anth. Inst., vol. vi. p. 20 *seqq.*, I had never met with its remains in any barrow, though the domesticated variety had been represented in several of both periods. Subsequently the tusk of a wild boar was found in the Nether Swell long barrow. The lower part of the horizontal ramus of the lower jaw of a wild boar found at Cissbury had been broken away, as has so often been noted in other instances, for the purpose of extracting the marrow; and the same practice had been put in force with the remains of two tame pigs found (as described above, p. 454) immediately behind the head of a female skeleton of the late Celtic period. The domestic British pig does not seem to me to differ in any important particulars from the races which we believe to be the descendants of the wild boar. Two bronze statuettes of the Gallo-Roman period given me by Mr. John Evans, as also many antique Italian terra cotta figures, show that the Romans in Gaul knew both the long-snouted wild-boar-like breed and the shorter-snouted better-bred race. The same contrast is shown in two plates (pl. iii. 4, pl. v. 5) of Sambon's 'Recherches sur les Monnaies Antiques de l'Italie,' Naples, 1870, the former of which gives us a pig with a very long and slender snout, whilst in the latter, which represents a sow suckling three young ones, we have, together with the pendent ears, so usually though not invariably characteristic of domestication, the short snout bent upwards so as to form, as in our best breeds, an angle with the plane of the sagittal suture along the roof of the skull. Columella may be cited in support of the same view, as he (lib viii. cap. 9) says that pigs with such short and recurved snouts were preferred to those of a different frontal profile; '*Quare in suillo pecore probandi sunt . . . . rostris brevibus et resupinis.*' But I have not found the skulls of this '*Cultur-Race*' in British burial-places, and the tenacity with which

very different races have maintained themselves in very many parts even of our less wild districts up to quite recent memory make this the less remarkable. The figures of the boar upon coins and shields of the late Keltic period, i.e. from *circa* 200 B.C. to *circa* 80 A.D., might perhaps be taken as confirming the conclusion which my examination of the osteological remains (given at length in the Transactions of the Linnæan Society, Zoological Series, vol. ii. 1877) had led me to, had they been more frequently and more distinctively than they are, figures of domesticated as opposed to wild animals. Still, what Mr. Franks writes (Horæ Ferales, p. 188, pl. xiv.) is to the purpose in this connexion, especially if we compare the plate referred to by him with plates vi, viii, xii, and xiii of Mr. Evans's 'British Coins.' Mr. Franks's words (*l. c.*) are as follows:—'The boar as seen on the Witham shield appears only on the older or autonomous coins of Gaul and Britain; on Roman civilisation being introduced, this national symbol was no longer a gaunt lean animal, as it appears on the shield, but a well-conditioned boar of a natural form and in a classical attitude[1].'

The small Scottish Highland and Island breed of pigs described by Low ('Domesticated Animals of the British Islands,' Eng. ed. p. 429, Fr. ed. pl. iii) and by Youatt ('The Pig,' 1847, pp. 50–52) as having sharp-pointed suberect ears, remarkably strong muscular snouts, an arched back (the 'Carp' back of the Germans), and

[1] The following passage from De Blainville's 'Osteographie,' 1847, fasc. xxii. p. 170, may be quoted as being a good instance of the folly of relying in these questions upon negative evidence, especially when the existence of that evidence is due simply to neglect of the three lines of enquiry available here, viz. the examination of bones; the excavation or other discovery of coins and works of art; and, thirdly, the examination of literature. Writing of *Sus* he says, 'Du temps de César il parait cependant qu'elle n'était pas encore parvenue dans les Gaules, car il n'est nullement question de cet animal dans ses Commentaires; elle s'y est donc propagée depuis la conquête d'où elle a passée en Angleterre qui ne possédait pas même de sanglier dans ses forets.' It is needless to refer to the innumerable discoveries of *Sus*, both wild and tame, in pre-Roman deposits in this country; and the unanimously accepted result of archæological enquiry may be shortly summed up in the following words of M. Montellier's 'Mémoires sur les Bronzes Antiques' (Paris, 1865, p. 41), 'Le de symbole sanglier était un symbole Celtique le plus ancien de tous les symboles adoptés dans les Gaules.' The evidence of literature tells even more strongly in the same direction. From Mr. Thomas Stephens's 'Literature of the Kymry' (second edition, 1876, pp. 236-270) I learn that this animal was taken by the Kymric poets as typifying the past and future fortunes of their race, and the number of odes translated in the pages referred to in which the persons addressed by those bards are apostrophised in its character is very great. Neither Mr. Stephens nor Mr. Davies can, I apprehend, be accused of want of sympathy with the race which they write of; but I note as regards this particular point that the only difference between them is that (pp. 237 and 270) whilst according to Mr. Davies in the Hoianau the pig is 'the symbol of Druidism,' it appears to Mr. Stephens that it 'allegorically represents the Kymry who inhabited the Principality.'

a forest of stiff bristles arising from it, may perhaps be taken as representing to us now what the ancient British domesticated pig was. The old Welsh pig resembles the Scotch in various points characterising an unimproved breed, but its large ears, spoken of familiarly by breeders as being 'as large as newspapers,' indicate that it has been more thoroughly domesticated. Its colour also is more constantly and deeply dark than is that of northern form [1]. But the size of the ears and the colouration are both exceedingly variable points. The condition of neglect and comparative freedom in which the still surviving Scotch breed is described as living has no doubt been constant since the earliest times; and we may, after making some allowances, fairly suppose that it must have produced the same changes in the soft and perishable parts, and so in the entire appearance of the swine of those days, that we can see it has done in those subjected to it now. The bones of the

[1] It is not safe to assume that any appearance of a black colour in a pig of this country shows it to be modern, as if this colour could only be due to some cross with the breed known as 'Neapolitan,' and called conveniently by Nathusius, on account of its distribution over the Mediterranean area occupied by Rome in her best days, the 'Roman' pig. For the colour of the pig is not only exceedingly variable *per se*, as stated above, and for reasons which we do not know; but it changes, as regards entire breeds, under the selective action of certain foods, viz. the paint-root, *Lachnanthes tinctoria*, and buckwheat, *Polygonum fagopyrum* (see Wyman, Spinola, and Heusinger, *citt.* Darwin, 'Origin of Species,' sixth edition, p. 9; 'Domestication,' second edition, ii. p. 332). The 'Roman' pig is now, as figured in Low, *l. c.*, of a deep black colour almost universally; but in classical times it was not so any more than the domestic Greek pig was of which Aristotle tells us (H. A. ii. 2. 14) the wild boar differed from it in being black. It is true that the sow of Æneid iii. 392 and viii. 45, 'Alba solo recubans, albi circum ubera nati,' is spoken of (viii. 81) as 'subitum atque oculis mirabile monstrum;' but Servius *in loco*, who from his date, A. D. 400, must have been familiar enough with 'Roman' pigs, explains the word *monstrum* thus, '*quia et subito et cum triginta porcellis est visa*,' which is quite an adequate explanation. Columella also contrasts (vi. 9) a '*grex nigræ setæ quam durissimæ densæque*' with a '*glabrum pecus vel etiam pistrinale album*' as being better suited for a '*regio frigida et pruinosa*.' Hence, though there is no doubt that one of the earliest effects of domestication upon the wild boar stock not uncommonly is to make the colour white or at least what Youatt calls 'dirty white' or 'yellowish brown,' there is also no doubt that the reverse of this may be effected by the same process in later stages or through the introduction of new disturbing influences. I incline to think that, though the reverse must have been the case with several of our common domestic animals, immigrating races of men have usually provided themselves with tame pigs by having recourse to the young of the wild-boar stock available on the area which they have occupied. For whilst wild swine everywhere lend themselves readily to domestication, it must in early times have been very difficult to transport or import even already domesticated pigs. The contrast in this latter point between the pig and the two animals, which most certainly of all must have been imported into Europe as domesticated, did not escape the notice of the ancient fabulist who, as referred to by Bochart, Hierozoicon, ii. 57, p. 698, spoke of the '*porcus, qui cum agno et lupra ad urbem deferebatur et quum illi pacate degerent solus se distorquebat*.'

domesticated prehistoric pig, it is almost needless to say, are the bones of small animals; nor does the early age at which the great majority of domestic swine were then as now slaughtered entirely explain this fact away.

As regards the sheep, *Ovis aries*, I have to say, firstly, that I think the caution with which any identification of any ovine or caprine bone from a prehistoric 'find' is usually recorded, should be so worded, or at least received, as to make us think it is at least as likely to be a sheep's bone as a goat's. The reverse is ordinarily taken as being implied. But anybody who will study the coloured drawing given by Low (Hist. Nat. An. Dom. de l'Europe, pls. i, ii, French ed.) as referred to by Rütimeyer (Fauna des Pfahlbauten, p. 129) of the 'dun-faced,' 'flounder-tailed,' '*brevicauda*,' 'goat-horned' variety of the sheep still existing in the islands north of the Pentland Firth, will see how difficult it must be to decide the question as to the absence or presence of the sheep at any particular prehistoric period, unless an entire skull be available for deciding the question. Nor is the variation which gives to the horns of the sheep, usually considered the most distinctive portion in the prehistoric skeletons left us, the shape of those of the goat, by any means confined to the Orkney or Shetland sheep. The same approach to the goat's character is noted of the horns of the Welsh higher mountain breed (Low, Fr. ed. p. 20, Eng. ed. p. 65) of sheep. Hence it is entirely unsafe to decide from the often fragmentary and detached horn-cores which we obtain from neolithic burials that the animal they belonged to was not a sheep.

But, secondly, though a sheep may have the horn-cores usually found in goats, a goat never has the horn-cores usually found in sheep. But such may be found in prehistoric interments[1].

[1] Since writing as above I have, through the kindness of Herren Edmund von Fellenberg and Grossrath Bürki in Bern, of Professor F. A. Forel of Lausanne, and of Dr. Uhlmann at Münchenbuchsee, had opportunities for examining the very rich collections of animal bones from the various lake-dwellings which owe so much to their protecting care. And I found that the caution which is necessary in dealing with the scanty and often imperfect remains available to me from our prehistoric graves is superfluous in face of their abundant and more complete specimens. The goat is richly and unambiguously represented in the stone-age lake-dwellings, and more abundantly indeed than the sheep in the early stone-age lake-dwellings of Moosseedorf. It seems however to have lost this numerical preponderance towards the end of the stone period, and to have become comparatively scarce in the bronze age. And I find that M. Kinberg, Stockholm Internat. Congres Anth., p. 831, tells us of Sweden that 'La Chêvre *Capra hircus* h. parait avoir été primitivement plus rare que le mouton. Elle est rare du moins dans les sepultures de l'âge de la pierre de la Vestergötlande.' These facts are entirely in keeping with the sus-

As regards the ox, *Bos taurus*, I have little to add to what has been written by others with the much larger stores available to their hands which the Swiss pile-dwellings and other habitations of the living prehistoric man have furnished. Rütimeyer, Fauna des Pfahlbauten, p. 127, and Naumann in his interesting memoir, Archiv für Anthropologie, viii. 1, 1875, p. 30, suggest that the variety of ox known in this country as *Bos longifrons*, and known abroad more correctly as regards structure, if not more conveniently as regards the appropriation of the name, as *Bos brachyceros*, is probably the oldest domestic animal with which we are acquainted. The older zoologists held (see Buffon, Hist. Nat. xi. 312, ed. 1755), perhaps rather as an article of faith than as the result of enquiry, that 'on a soumis le brebis et le chèvre avant d'avoir domptè le cheval, le bœuf ou le chameau.' The dog and the pig have on the grounds of their present and their pristine distribution in space, of their readiness to attach themselves to

picions hinted at in the text, and with the view that our domestic animals, though coming in the ultimate resort from the East, like nephrite and jade in the stone-, and bronze probably in the bronze-period, did not reach the regions north of the Alps directly from the East, but only by passing northwards from the Greek and Italian peninsulas. For the goat, as has been repeatedly observed from the time of Aristotle (Hist. An. ix. 4) down to the present, bears cold less well than the sheep, whilst every traveller in sunburnt barren countries may observe with gratitude and wonder what copious supplies of milk are obtained from it, often off but limited areas in these surroundings, and from but shrubs and weeds. The sheep on the other hand, is, as its resting-places on the '*Schatten-seite*' of a mountain show us, more sensitive to heat and more appreciative of the 'shadow of a great rock in a weary land' than most animals. As described in the beautiful translations of a modern Greek ballad, by Niebuhr and Miss Winkworth (Life and Letters, vol. ii. p. 23, ed. 1852), it loves the 'still cold fountain' of the 'many fountained' mountain-top, *πολυπίδακος ἀκρωρείης*, whilst, as a visit to the hungry and thirsty, stony and light-soiled, island of Rhenea showed me, the goat will retain its vigour and independence of bearing with but the scantiest supply of succulent vegetation and of pure water. The goat possesses certain advantages over the sheep as a domestic animal in a 'barren and dry land where no water is,' but in a palustrine or lacustrine district it possesses none. And I submit therefore that the abundance of it in the Swiss lake-dwellings can be reasonably explained by supposing that it was carried thither by a people or tribe migrating northwards from the Mediterranean countries. Uncultivated races, as is well known and can still be observed, will adhere with a persistence which, if not wholly intelligent, is yet not wholly unpleasing, to their own domesticated animals even when their inferiority to other available breeds is demonstrated; and the goat, on its side, will, as Buffon has remarked (Hist. Nat. v. 66, ed. 1755), attach itself to man with an irrepressible fixity correlated with its traditional petulance.

The importance of these points in the natural history of the goat is impressed upon us from the purely anatomical point of view by the absence of any well-marked Western varieties of it; whilst the greater utility of the sheep in our latitudes is shown contrariwise by the multitude of such varieties into which it has effloresced under domestication in a period throughout which the goat has remained as unchanged as the weeds it feeds upon.

man and share his fortunes, and, I incline to think, most of all, of their solidarity with him in supporting the alternation of generations of certain entozoa, perhaps equal claims in this matter with the other five animals specified. For my own part I should incline to favour the claims of the dog, on the general grounds of the hunting stage having been earlier in date than the pastoral and of the facility with which commensalism would be set up between the two species when they happened to enter into partnership in the chase. What I saw at Cissbury (see Journal Anth. Institute, July, 1876, vol. vi. p. 22) impressed me very much with the idea that the pitfall counted for much more in the earliest times than I had previously imagined. A wild animal was much more easily mastered in that way[1] than in any other available to the man to whom

> 'Arma antiqua manus, ungues, dentesque fuerunt
> Et lapides et item sylvarum fragmina rami.'—Lucret. v. 1282.

The wild dogs which fed themselves or were allowed to feed upon the remnants of the animals thus caught and slaughtered would not be slow to learn the lesson of attachment to place, and out of, or upon this, might very readily grow the feeling of attachment to person. It requires a greater effort of imagination on our part to imagine a pack of wild dogs co-operating with priscan men in driving a herd of wild cattle or wild pigs (both of which were represented in the Cissbury pits) along a track in which a pitfall had been dug and covered over. Still what we know of the relations subsisting between savage men and dogs or dingoes

[1] Cæsar's words (B. G. vi. 28) used of the Germans capturing *Bos primigenius*, '*hos studiose foveis captos interficiunt*,' I had commented upon (Journ. Anth. Inst., *l. c.*) before learning that Keller ('Lake Dwellings,' pp. 298, 299, trans. Lee) had written as he has done. The Old Testament writers make innumerable references to the use of the pitfall. The tradition of its employment by the Ancient Britons survived into the days of Henry V., and of Hardyng who in his 'Chronicle in Metre fro the first Begynning of Englande,' *cit.* Youatt on the sheep, speaks of 'pitfalles and trappes' as well as

> 'Arrows and boltes
> To slee the deere, the bull, also the bore,
> The bear, and byrdes that were therein before.'

For the use of the pitfall by the Esquimaux, see an excellent paper by N. L. Austen, Esq., in the 'Reliquiæ Aquitanicæ,' p. 217. The fact that the Esquimaux have fitted their pitfall for the reindeer with a trap-door revolving on two short axles of wood, as is done in the so-called 'tipe' or 'tip' in rabbit warrens, together with other considerations, makes me doubt whether Daniel (Rural Sports, vol. i. p. 351) can be right in holding that this last is 'a modern invention.' The Norway reindeer is similarly taken in a 'rengraven' (see Austen, *l. c.*), and the kangaroo in Western Australia (see Eyre, Central Australia, ii. 278; Nind, Journ. Royal Geog. Soc. i. p. 30, 1831).

(see Nind, *l. c.*, p. 29) justifies us in holding that this second stage of co-operation may have been attained to very early in the history of our species.

The contrast, common in ancient writings, both sacred and profane, between *Bos primigenius*, '*magnitudine paullo infra elephantos*,' as Cæsar wrote of them (De Bell. Gall., vi. 28), and the tamed variety or varieties of the species, with the '*tenue et miserabile collum*' which Juvenal (Sat. x. 270) half pathetically describes, were seen in eminently instructive contrast in the Cissbury pits, the filling up of which with chalk rubble had very effectually preserved the bones. By the spar-like hardness and lustre, by the sharply-defined ridges and sculpturing of the surface, and, finally, by the huge size of the wild animals' bones when viewed in contrast with those of the tame races, we are helped as effectually as by almost any other means to realise the immense difference which exists between those times and ours; in which last the representatives of the wild ox, still surviving under Lord Tankerville's care at Chillingham in an at least half-wild state, are so much smaller, and the domestic races so much larger. The wild animal of prehistoric times to attain and sustain its vast bulk must have had command of good pasturage which even the cherished and protected herds of modern wild cattle might envy, but with this, itself a thing possible only in a district occupied but sparsely by man, there co-operated another agency distinctive of a wild country. This agency was the selecting agency of carnivora, in the Britain of those times chiefly wolves, which would weed out the weaker members of each herd, long before they attained the sexual maturity which might have enabled them to bring into being a stock of weakness and smallness like their own. The rifle-bullet, on the other hand, of modern days selects the monarch of the herd, and leaves the sustentation of the race to the despised smaller representatives of it. The differences between the conditions affecting the domestic breeds of ancient and modern times respectively are at least as striking. The range available to a savage tribe ever at war with its neighbours, as is the habit of modern, as it was of ancient uncivilised tribes, must have been limited and small relatively to the number of the cattle which a tribe devoid of cerealia must have had for their sustentation. This would affect the animal during the whole period of its growth, and very materially. And we have to add to this the consideration that not only were such articles as turnips wholly unknown to the ancient Briton, but that even such an art as that

of making and storing hay was as yet uninvented. The contemplation of a herd of dark-coloured mountain cattle in the north of this country, of small size and yet with ragged, 'ill-filled' out contours, standing on a wintry day in a landscape filled with birch, oak, alder, heath, and bracken, has often struck me as giving a picture which I might take as being very probably not wholly unlike that which the eyes of the ancient British herdsman were familiar with. But the treatment which the domestic ruminant is all but necessarily and universally subjected to in the very earliest days of its life when owned by a savage, is found in modern days and in very different climates from ours to be sufficient to stunt its growth effectually, even in the absence of the unfavourable conditions alluded to. The milk which naturally should have gone to build up the body of the newly-born animal is, in great part at least, taken for the use of its owner and his human family. The vast difference in size between the domestic buffalo of Hindostan, *Bos bubalus*, and the wild variety or Arnee[1], is due, I apprehend, to the working of this agency upon the former as against the selective agency of the carnivora upon the latter; and the like causes must have produced the like effects in former times.

I take this opportunity of putting on record the points in which the collections of various objects from the Swiss lake-dwellings seen by me under the favourable conditions above specified (p. 740, note) differ from those procured from British prehistoric graves.

The absence of any traces of cerealia in our neolithic barrows puts them at once into sharp contrast with the Swiss lake-dwellings even of the early stone age such as Moosseedorf and Wangen; and though the frequent occurrence of unthrashed-out ears in the specimens from these habitations shows, as Dr. H. Christ (*l. c.*) has observed, that their tenants were in a very primitive state, still the presence and botanical characters of these 'Kultur-

[1] An anonymous but excellent naturalist in the 'Zoologist' (1858, 1859, vol. xvi. p. 6554) writes thus as to the great difference in size existing between the wild and tame buffalo to the advantage of the former: 'We believe the main reason of it to be that the tame calves are deprived of their due supply of milk. The importance of an ample supply of suitable nourishment in early life, as bearing on the future development of any animal, cannot be over-estimated.' He also states on the authority of a friend that the Burmese domestic buffalo is 'much larger than in Bengal, with splendid horns, and altogether a vastly superior animal, in fact, resembling the wild buffalo. The Burmese never milk them; having the same strange prejudice to milk which the Chinese have, though otherwise both peoples are nearly omnivorous.' See Specimens 1350 and 1351, Oxford University Museum, the one from a wild, the other from a tame buffalo.

planzen,' as also of the weeds accompanying them, proves that these men had at one time or other some direct or indirect communication with Mediterranean regions. (See Prof. Heer in Keller's Lake Dwellings, trans. Lee, p. 342 *seqq.*) The textile flax-fabrics so prominent in every series from the Swiss lake-dwellings, even from the very early one of Schaffis, are as completely wanting in British stone-age barrows as the cerealia.

A second point of equally striking contrast is furnished to us by the great inferiority of all British pottery of the stone- and bone-periods to that at least of the later stone age in Switzerland. It is true that from such a very early lake-dwelling as that of Schaffis, pottery of the most primitive kind possible, imperfectly burnt, coarse alike in composition and contour, may, as the series in the University Museum obtained through the kindness of Herr E. von Fellenberg and the exertions of the Rev. H. B. George shows, be obtained; and that speaking generally all the pottery of the Swiss stone age is inferior in shape, paste, and size to that of the bronze age. Still with my recollection of the best specimens of British long-barrow pottery, such as those referred to pp. 536–537 *supra*, as found by myself and others, I needed when at Morges a very definite assurance from that entirely indisputable authority Professor F. A. Forel, to make me believe, as I do, that certain pottery of a much higher degree of excellence had really belonged to the stone age.

Thirdly, even in the very early lake-dwelling of Schaffis, barbed and tanged arrow-heads have been found, as indeed also in Danish and Breton stone-age interments; whilst our long barrows have, as Dr. Thurnam remarked, never furnished us with any arrow-heads perfected beyond the leaf-shape.

Fourthly, the practice of boring, however roughly and by whatever process, the stone axe for the reception of the haft was not unknown even to the lake-dwellers of Schaffis (see Herr E. v. Fellenberg's Bericht über die Pfahlbauten des Bielersees, 1875, p. 78), whilst, as Mr. John Evans (Ancient Stone Implements of Great Britain, p. 49) has remarked, the stone axes of this period, at least in Britain, were rarely perforated.

The similarly all but, if not entirely, complete absence of nephrit- and jadeit-implements from our British prehistoric series constitutes a fifth point of contrast between them and those procured from the Swiss lakes; and to the 'Ethnographisch-archæologischer Bedeutung' (to use the words of Prof. H. Fischer in his model

monograph 'Nephrit und Jadeit,' 1875, p. 1; see also pp. 48, 49, 54, 355, 367, 377) of this negative fact, we must under all the circumstances of the case assign a very high place.

Wild animals, sixthly, are but sparingly represented in early British graves, whilst in some at least of the earliest Swiss lake-dwellings they have a numerical preponderance over the domesticated breeds. It is right however to add that in the early British dwellings for the living and in early British excavations such as the flint mines at Cissbury, this numerical inferiority of the wild fauna is by no means so distinctly pronounced (see Journal Anthrop. Institute, vol. vi. p. 20, 1876).

Seventhly, as regards the craniography of our own species, the skulls of the Swiss lake-dwellers of both stone- and bronze-periods alike belong to that 'massive and grandiose' variety of the dolicho-cephalic type which the Swiss ethnographers, His and Rütimeyer, have in their often-referred to 'Crania Helvetica' called the 'Sion Typus.' In other words, we have in Switzerland no such evidence for the immigration of a fresh race of men at the commencement of the bronze period as we have furnished to us in Great Britain by the appearance contemporaneously with metal implements of brachy-cephalic crania in preponderating numbers. It may however be objected here that this seventh point of difference, like indeed all the other six, depends simply on negative evidence; and that the entire number of human skulls recovered from the lake-dwellings has been, as might from the very nature of the case have been expected, very small. On the other hand, I have to say that an English ethnologist, convinced, as due examination of the evidence (see p. 712 *supra*) will convince him, that a very thorough, if not absolutely exhaustive, displacement of the races previously in occupation of what is now his country was effected by the Teutonic immigration of the fifth and succeeding century, may very easily be over-ready to believe that other invasions may have been similarly overwhelming. The Swiss ethnologists, at all events, after fairly stating the two opposed views, declare themselves to be of opinion that one and the same dolicho-cephalic stock persisted through the two periods in question. Their words run thus (Crania Helvetica, p. 37):—'Wir sind durch diese Unterbringung des Meilen- und des Auvernier-Schädel zu einem hochst erfreulichen Resultate gelangt heinsichtlich der Bevolkerung die die Pfahlbauten, während der ersten Zeit ihres Bestehens in der sog- Stein- und Bronze-Periode

bewohnt hat. Bekanntlich haben unsere hervorragenderen Alterthumforscher über dieser Punkt sich noch nicht geeinigt; eines theils vertritt Herr Troyon in seinen Habitations lacustres die Ansicht, es habe in den verschiedenen Perioden der Pfahlbau-Zeit eine Succession von verschiedenen Bevolkerungen stattgefunden; es sei die Bevolkerung der Steinzeit durch eine völlig neue der Bronzezeit, und diese durch eine solche der Eisenzeit verdrängt worden: anderntheils aber hat Herr Dr. Ferd. Keller aus dem allmähligen Fortschreiten der Kultur in der Pfahlbaustationen, aus der mannigfachen Formübereinstimmung der Stein- und der Bronze-, dieser und der Eisenobjecte, und aus dem Vorhandensein mannigfacher Uebergangstationen wahrscheinlich gemacht, dass die Pfahlbau-Bevolkerung der verschiedenen Kulturperioden doch nur einen und demselben Stamm, dem Keltischen, angehört habe. Die Ergebnisse der craniologischen Forschung sprechen, wie man sieht, für diese letztere Annahme, und wir dürfen, gestutzt auf die ober mitgetheilte Schädelvergleichen, allerdings mit Bestimmtheit aussprechen, dass die Pfahlbaubevölkerung der Stein- und Bronzezeit desselben Stammes gewesen sei, wie die, später dies Land behauptenden Helvetier.'

Some Swiss historians (see Crania Helvetica, p. 34) are inclined to hold that remnants of the Cimbric invaders still survive in their country; and the light hair combined with typically brachycephalic skull (see p. 680 *supra*) which so constantly meets the eye in Switzerland may incline us to favour this view. It may seem to be going out of the way to take up with this hypothesis when there is a characteristically brachy-cephalic stock occupying at the present day, as it has done no doubt uninterruptedly from prehistoric times, the conterminous region of the Grisons. The Roumansch race, however, is dark-haired, whilst the Swiss brachycephali are, especially as compared with the French, light-haired; the relations between the Rhæti and the Helvetii was in historic times (see Crania Helvetica, p. 33) ordinarily the reverse of amicable; and what appears to me a most convincing argument of all, rye, a cereal the place of origin of which is supposed by De Candolle (Geograph. Botan. Raisonnée, ii. 938–940) to be in the district to the east of the Alps, and which has been the staple food of the Grisons, has, like oats and spelt, never been found in the lake-dwellings.

Eastern Switzerland is known, both from linguistic and from historical evidence, to owe a very large part of its population to the

Alemannian invasion; the physical characters however of this race were different from those of the Cimbric probably, and certainly from those of the Roumansch, and of the brachy-cephalic stock (see p. 679 *supra*) abundant in South Germany at the present day.

From the phænomena presented by the pottery, by the implements, by the cultivated plants and domesticated animals of prehistoric times in this and other countries, arguments have been drawn in favour of one or other of three theories, which may for the sake of brevity be spoken of as the theory of Immigration with more or less displacement of any population previously in occupation, the theory of Importation without immigration, and the theory called by its supporters the 'Autochthony' of these products. It may be well here to give references to authorities who have pronounced themselves in favour of one or other of each of these three views.

In favour of the first theory we may cite Rütimeyer, who (Fauna des Pfahlbauten, pp. 160–162, 1861) speaks of the introduction of bronze as being a 'Wendepunkt der möglicherweise mit dem Auftreten neuer Völkerstämme in Verbindung stand;' and suggests that the appearance of a new race of domestic dogs at the commencement of that period indicates the setting up of intercourse with or replacement by a fresh race of men. In the same sense we find Prof. E. Désor (Le Bel Age du Bronze Lacustre, p. 11, 1874) speaking of the weeds, such as *Centaurea cyanus* and *Silene cretica*, which accompany the cerealia of the lake-dwellings as those of modern Switzerland, thus, 'Etrangères à notre flore comme les céréales ellesmême elles sont suivi le sort de ces dernières, et nous sont venues d'Orient, peutêtre avec les premiers colons lacustres.'

Dr. Oswald Heer, however, a botanist of whose investigations Switzerland may justly be proud, in laying these facts before the world, as in Troyon's 'Habitations lacustres,' p. 443, and Keller's 'Lake Dwellings,' transl. Lee, p. 344, appears to adhere to the second of the two views above stated; as indeed Keller himself does (*l. c.* pp. 56 and 309) in the following words used of another product foreign to Switzerland, namely, nephrit, 'It was not brought by the settlers with them from their earlier abodes, but was acquired by barter in later times, after they had lived for centuries in the lake-dwellings of our country.' In the second of the two passages referred to Keller says distinctly, 'There is no ground for concluding that successive peoples of different races or civilisations have occupied these lake-dwellings, one of which

has chased the other from its abodes in order to occupy them themselves.'

In spite of this, however, scientific opinion in Switzerland seems to me to gravitate rather in the direction of the former of these two views. And this I say, though Herr Edmund v. Fellenberg (Bericht, *l. c.* p. 15) puts both of them forward without distinctly indicating to which of the two he inclines. He points out that the two minerals nephrit and jadeit are found only in Central Asia, China, New Zealand, and South America; that only a single unworked block, and that one probably dropped by the importers, has been found in Europe at Schwemmsal in Saxony; and that the usually sharp and little worn-down implements and weapons made of these two highly resistant minerals are found in somewhat different proportions in different parts of Switzerland, the nephrit- preponderating in the eastern and the jadeit-weapons in the western lake dwellings; but he sums up the discussion by asking impartially, 'Sollten Einwanderungen von verschiedenen Seiten stattgefunden haben, oder hatten diese Stämme Handelsbeziehungen nach verschiedenen Richtungen hin[1]?'

The third view, diametrically opposed to the two first enunciated, was put forward by M. Dupont, with the protection of the honoured name of Steenstrup, at the meeting of the International Anthropological Congress at Stockholm in 1874, in the following words (Compte Rendu, p. 821):—

'Dans la précédente session du Congrès, M. Steenstrup a émis l'idée après avoir examiné les collections recueillies dans les cavernes belges, que nos principales espèces domestiques pourraient à la rigueur être originaires du sol qu'elles habitent et y avoir été directement assujéties par l'homme. Cette solution est loin d'être improbable. Elle a ceci de frappant de se trouver en accord avec les principes qui tendent à s'établir dans l'anthropologie, et d'après lesquels les conquêtes violentes et les déplacements des peuples auraient joué dans la constitution de nos populations, un rôle fundamental moins important que celui qu'on avait été d'abord porté à leurs attribuer; la grande masse des habitants d'un pays étant composée par les très anciens occupants du sol et non par les envahisseurs. Ces principes ont été surtout soutenus avec convic-

[1] Mr. H. Cayley's valuable account of his own visit to the old Jade quarries of Kúenlún given in Macmillan's Magazine for October, 1871, appears to have escaped the all but exhaustive research displayed in Dr. Heinrich Fischer's 'Nephrit und Jadeit' already referred to, p. 746.

tion par MM. de Quatrefages et Virchow durant ces dernières années pour les peuples Européens. La même thèse a été défendue récemment à l'aide d'une grande érudition et d'une argumentation persuasive, pour les langues occidentales[1]. Je crois, pouvoir prouver de nous côté que notre âge de la pierre[2] polie n'est pas le résultat d'une importation, mais qu'il apris naissance dans nos regions mêmes.'

Professor Steenstrup is reported as having expressed himself entirely to the opposite effect in the Compte Rendu (p. 163) of the International Congress held at Copenhagen in 1869; and unless he changed his opinion in the interval between 1869 and 1873, it must be through some error that his name is quoted as in the above extract from the Stockholm Compte Rendu. There is no room however for suggesting that the reference to M. Granier de Cassagnac's work is made through inadvertence; and I must remark therefore that no conclusion however much in want of support can gain much by a reference to that production. On the other hand, the respectable authority of Dr. H. Christ (in Rütimeyer's Fauna des Pfahlbauten, pp. 225-226) can be brought forward for 'die Autochthonie' theory.

I cannot understand how any one with the evidence properly before him can doubt that the goat, sheep, horse, and dog were in the earliest neolithic times imported as domesticated animals into this country and into Switzerland. The ease with which the calf of a pit-fall-taken *Bos primigenius* would be domesticated, as well as some other reasons, may make it just possible that the domestic cow of those times may not in all cases have been imported already tamed. But I incline to think that this really was most commonly the case.

On the other hand, having been convinced by what I saw in the Swiss collections from Schaffis and elsewhere that the small race of swine *Sus scrofa*, var. *palustris*, existed there as a wild race; and coupling this with the facts, on the one side, of the exceeding readiness with which this species lends itself to domestication, and on the other side, of the considerable difficulties which attend its transport over great distances in space, I incline to think that this animal may have had a different history from the others just mentioned, and may have been domesticated upon the spot.

[1] Granier de Cassagnac, Les origines de la langue Francaise. Paris, 1872.
[2] Compte rendu du Congrès de 1872, p. 459.