The Descent of Man and Selection in Relation to Sex

by
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Introduction

The nature of the following work will be best understood by a brief account of how it came to be written. During many years I collected notes on the origin or descent of man, without any intention of publishing on the subject, but rather with the determination not to publish, as I thought that I should thus only add to the prejudices against my views. It seemed to me sufficient to indicate, in the first edition of my 'Origin of Species,' that by this work "light would be thrown on the origin of man and his history;" and this implies that man must be included with other organic beings in any general conclusion respecting his manner of appearance on this earth. Now the case wears a wholly different aspect. When a naturalist like Carl Vogt ventures to say in his address as President of the National Institution of Geneva (1869), "personne, en Europe au moins, n'ose plus soutenir la creation independante et de toutes pieces, des especes," it is manifest that at least a large number of naturalists must admit that species are the modified descendants of other species; and this especially holds good with the younger and rising naturalists. The greater number accept the agency of natural selection; though some urge, whether with justice the future must decide, that I have greatly overrated its importance. Of the older and honoured chiefs in natural science, many unfortunately are still opposed to evolution in every form.

In consequence of the views now adopted by most naturalists, and which will ultimately, as in every other case, be followed by others who are not scientific, I have been led to put together my notes, so as to see how far the general conclusions arrived at in my former works were applicable to man. This seemed all the more desirable, as I had never deliberately applied these views to a species taken singly. When we confine our attention to any one form, we are deprived of the weighty arguments derived from the nature of the affinities which connect together whole groups of organisms--their geographical distribution in past and present times, and their geological succession. The homological structure, embryological development, and rudimentary organs of a species remain to be considered, whether it be man or any other animal, to which our attention may be directed; but these great classes of facts afford, as it appears to me, ample and conclusive evidence in favour of the principle of gradual evolution. The strong support derived from the other arguments should, however, always be kept before the mind.

The sole object of this work is to consider, firstly, whether man, like every other species, is descended from some pre-existing form; secondly, the manner of his development; and thirdly, the value of the differences between the so-called races of man. As I shall confine myself to these points, it will not be necessary to describe in detail the differences between the several races--an enormous subject which has been fully described in many valuable works. The high antiquity of man has recently been demonstrated by the labours of a host of eminent men, beginning with M. Boucher de Perthes; and this is the indispensable basis for understanding his origin. I shall, therefore, take this conclusion for granted, and may refer my readers to the admirable treatises of Sir Charles Lyell, Sir John Lubbock, and others. Nor shall I have occasion to do more than to allude to the amount of difference between man and the anthropomorphous apes; for Prof. Huxley, in the opinion of most competent judges, has conclusively shewn that in every visible character man differs less from the higher apes, than these do from the lower members of the same order of Primates.

This work contains hardly any original facts in regard to man; but as the conclusions at which I arrived, after drawing up a rough draft, appeared to me interesting, I thought that they might interest others. It has often

and confidently been asserted, that man's origin can never be known: but ignorance more frequently begets confidence than does knowledge: it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science. The conclusion that man is the co-descendant with other species of some ancient, lower, and extinct form, is not in any degree new. Lamarck long ago came to this conclusion, which has lately been maintained by several eminent naturalists and philosophers; for instance, by Wallace, Huxley, Lyell, Vogt, Lubbock, Buchner, Rolle, etc. (1. As the works of the first- named authors are so well known, I need not give the titles; but as those of the latter are less well known in England, I will give them:--'Sechs Vorlesungen uber die Darwin'sche Theorie:' zweite Auflage, 1868, von Dr L. Buchner; translated into French under the title 'Conferences sur la Theorie Darwinienne,' 1869. 'Der Mensch im Lichte der Darwin'sche Lehre,' 1865, von Dr. F. Rolle. I will not attempt to give references to all the authors who have taken the same side of the question. Thus G. Canestrini has published ('Annuario della Soc. d. Nat.,' Modena, 1867, page 81) a very curious paper on rudimentary characters, as bearing on the origin of man. Another work has (1869) been published by Dr. Francesco Barrago, bearing in Italian the title of "Man, made in the image of God, was also made in the image of the ape."), and especially by Haeckel. This last naturalist, besides his great work, 'Generelle Morphologie' (1866), has recently (1868, with a second edition in 1870), published his 'Naturliche Schopfungsgeschichte,' in which he fully discusses the genealogy of man. If this work had appeared before my essay had been written, I should probably never have completed it. Almost all the conclusions at which I have arrived I find confirmed by this naturalist, whose knowledge on many points is much fuller than mine. Wherever I have added any fact or view from Prof. Haeckel's writings, I give his authority in the text; other statements I leave as they originally stood in my manuscript, occasionally giving in the foot-notes references to his works, as a confirmation of the more doubtful or interesting points.

During many years it has seemed to me highly probable that sexual selection has played an important part in differentiating the races of man; but in my 'Origin of Species' (first edition, page 199) I contented

myself by merely alluding to this belief. When I came to apply this view to man, I found it indispensable to treat the whole subject in full detail. (2. Prof. Haeckel was the only author who, at the time when this work first appeared, had discussed the subject of sexual selection, and had seen its full importance, since the publication of the 'Origin'; and this he did in a very able manner in his various works.) Consequently the second part of the present work, treating of sexual selection, has extended to an inordinate length, compared with the first part; but this could not be avoided.

I had intended adding to the present volumes an essay on the expression of the various emotions by man and the lower animals. My attention was called to this subject many years ago by Sir Charles Bell's admirable work. This illustrious anatomist maintains that man is endowed with certain muscles solely for the sake of expressing his emotions. As this view is obviously opposed to the belief that man is descended from some other and lower form, it was necessary for me to consider it. I likewise wished to ascertain how far the emotions are expressed in the same manner by the different races of man. But owing to the length of the present work, I have thought it better to reserve my essay for separate publication.

Part I

The Descent or Origin of Man

Chapter I

The Evidence of the Descent of Man from Some Lower Form

Nature of the evidence bearing on the origin of man--Homologous structures in man and the lower animals--Miscellaneous points of correspondence--Development--Rudimentary structures, muscles, sense-organs, hair, bones, reproductive organs, etc.--The bearing of these three great classes of facts on the origin of man.

He who wishes to decide whether man is the modified descendant of some pre- existing form, would probably first enquire whether man varies, however slightly, in bodily structure and in mental faculties; and if so, whether the variations are transmitted to his offspring in accordance with the laws which prevail with the lower animals. Again, are the variations the result, as far as our ignorance permits us to judge, of the same general causes, and are they governed by the same general laws, as in the case of other organisms; for instance, by correlation, the inherited effects of use and disuse, etc.? Is man subject to similar malconformations, the result of arrested development, of reduplication of parts, etc., and does he display in any of his anomalies reversion to some former and ancient type of structure? It might also naturally be

enquired whether man, like so many other animals, has given rise to varieties and sub-races, differing but slightly from each other, or to races differing so much that they must be classed as doubtful species? How are such races distributed over the world; and how, when crossed, do they react on each other in the first and succeeding generations? And so with many other points.

The enquirer would next come to the important point, whether man tends to increase at so rapid a rate, as to lead to occasional severe struggles for existence; and consequently to beneficial variations, whether in body or mind, being preserved, and injurious ones eliminated. Do the races or species of men, whichever term may be applied, encroach on and replace one another, so that some finally become extinct? We shall see that all these questions, as indeed is obvious in respect to most of them, must be answered in the affirmative, in the same manner as with the lower animals. But the several considerations just referred to may be conveniently deferred for a time: and we will first see how far the bodily structure of man shews traces, more or less plain, of his descent from some lower form. In succeeding chapters the mental powers of man, in comparison with those of the lower animals, will be considered.

The Bodily Structure of Man

It is notorious that man is constructed on the same general type or model as other mammals. All the bones in his skeleton can be compared with corresponding bones in a monkey, bat, or seal. So it is with his muscles, nerves, blood-vessels and internal viscera. The brain, the most important of all the organs, follows the same law, as shewn by Huxley and other anatomists. Bischoff (1. 'Grosshirnwindungen des Menschen,' 1868, s. 96. The conclusions of this author, as well as those of Gratiolet and Aeby, concerning the brain, will be discussed by Prof. Huxley in the Appendix alluded to in the Preface to this edition.), who is a hostile witness, admits that every chief fissure and fold in the brain of man has its analogy in that of the orang; but he adds that at no period of development do their brains perfectly agree; nor could perfect agreement be expected, for otherwise their mental powers would have been the same. Vulpian (2. 'Lec. sur la Phys.' 1866, page 890, as quoted

by M. Dally, 'L'Ordre des Primates et le Transformisme,' 1868, page 29.), remarks: "Les differences reelles qui existent entre l'encephale de l'homme et celui des singes superieurs, sont bien minimes. Il ne faut pas se faire d'illusions a cet egard. L'homme est bien plus pres des singes anthropomorphes par les caracteres anatomiques de son cerveau que ceux-ci ne le sont non seulement des autres mammiferes, mais meme de certains quadrumanes, des guenons et des macaques." But it would be superfluous here to give further details on the correspondence between man and the higher mammals in the structure of the brain and all other parts of the body.

It may, however, be worth while to specify a few points, not directly or obviously connected with structure, by which this correspondence or relationship is well shewn.

Man is liable to receive from the lower animals, and to communicate to them, certain diseases, as hydrophobia, variola, the glanders, syphilis, cholera, herpes, etc. (3. Dr. W. Lauder Lindsay has treated this subject at some length in the 'Journal of Mental Science,' July 1871; and in the 'Edinburgh Veterinary Review,' July 1858.); and this fact proves the close similarity (4. A Reviewer has criticised ('British Quarterly Review,' Oct. 1st, 1871, page 472) what I have here said with much severity and contempt; but as I do not use the term identity, I cannot see that I am greatly in error. There appears to me a strong analogy between the same infection or contagion producing the same result, or one closely similar, in two distinct animals, and the testing of two distinct fluids by the same chemical reagent.) of their tissues and blood, both in minute structure and composition, far more plainly than does their comparison under the best microscope, or by the aid of the best chemical analysis. Monkeys are liable to many of the same non-contagious diseases as we are; thus Rengger (5. 'Naturgeschichte der Saugethiere von Paraguay,' 1830, s. 50.), who carefully observed for a long time the Cebus Azarae in its native land, found it liable to catarrh, with the usual symptoms, and which, when often recurrent, led to consumption. These monkeys suffered also from apoplexy, inflammation of the bowels, and cataract in the eye. The younger ones when shedding their milk-teeth often died from fever. Medicines produced the same effect on them as on us. Many kinds of monkeys have a strong taste for tea, coffee, and spiritous

liquors: they will also, as I have myself seen, smoke tobacco with pleasure. (6. The same tastes are common to some animals much lower in the scale. Mr. A. Nichols informs me that he kept in Queensland, in Australia, three individuals of the Phaseolarctus cinereus; and that, without having been taught in any way, they acquired a strong taste for rum, and for smoking tobacco.) Brehm asserts that the natives of north-eastern Africa catch the wild baboons by exposing vessels with strong beer, by which they are made drunk. He has seen some of these animals, which he kept in confinement, in this state; and he gives a laughable account of their behaviour and strange grimaces. On the following morning they were very cross and dismal; they held their aching heads with both hands, and wore a most pitiable expression: when beer or wine was offered them, they turned away with disgust, but relished the juice of lemons. (7. Brehm, 'Thierleben,' B. i. 1864, s. 75, 86. On the Ateles, s. 105. For other analogous statements, see s. 25, 107.) An American monkey, an Ateles, after getting drunk on brandy, would never touch it again, and thus was wiser than many men. These trifling facts prove how similar the nerves of taste must be in monkeys and man, and how similarly their whole nervous system is affected.

Man is infested with internal parasites, sometimes causing fatal effects; and is plagued by external parasites, all of which belong to the same genera or families as those infesting other mammals, and in the case of scabies to the same species. (8. Dr. W. Lauder Lindsay, 'Edinburgh Vet. Review,' July 1858, page 13.) Man is subject, like other mammals, birds, and even insects (9. With respect to insects see Dr. Laycock, "On a General Law of Vital Periodicity," 'British Association,' 1842. Dr. Macculloch, 'Silliman's North American Journal of Science,' vol. XVII. page 305, has seen a dog suffering from tertian ague. Hereafter I shall return to this subject.), to that mysterious law, which causes certain normal processes, such as gestation, as well as the maturation and duration of various diseases, to follow lunar periods. His wounds are repaired by the same process of healing; and the stumps left after the amputation of his limbs, especially during an early embryonic period, occasionally possess some power of regeneration, as in the lowest animals. (10. I have given the evidence on this head in my 'Variation

of Animals and Plants under Domestication,' vol. ii. page 15, and more could be added.)

The whole process of that most important function, the reproduction of the species, is strikingly the same in all mammals, from the first act of courtship by the male (11. Mares e diversis generibus Quadrumanorum sine dubio dignoscunt feminas humanas a maribus. Primum, credo, odoratu, postea aspectu. Mr. Youatt, qui diu in Hortis Zoologicis (Bestiariis) medicus animalium erat, vir in rebus observandis cautus et sagax, hoc mihi certissime probavit, et curatores ejusdem loci et alii e ministris confirmaverunt. Sir Andrew Smith et Brehm notabant idem in Cynocephalo. Illustrissimus Cuvier etiam narrat multa de hac re, qua ut opinor, nihil turpius potest indicari inter omnia hominibus et Quadrumanis communia. Narrat enim Cynocephalum quendam in furorem incidere aspectu feminarum aliquarem, sed nequaquam accendi tanto furore ab omnibus. Semper eligebat juniores, et dignoscebat in turba, et advocabat voce gestuque.), to the birth and nurturing of the young. Monkeys are born in almost as helpless a condition as our own infants; and in certain genera the young differ fully as much in appearance from the adults, as do our children from their full-grown parents. (12. This remark is made with respect to Cynocephalus and the anthropomorphous apes by Geoffroy Saint-Hilaire and F. Cuvier, 'Histoire Nat. des Mammiferes,' tom. i. 1824.) It has been urged by some writers, as an important distinction, that with man the young arrive at maturity at a much later age than with any other animal: but if we look to the races of mankind which inhabit tropical countries the difference is not great, for the orang is believed not to be adult till the age of from ten to fifteen years. (13. Huxley, 'Man's Place in Nature,' 1863, p. 34.) Man differs from woman in size, bodily strength, hairiness, etc., as well as in mind, in the same manner as do the two sexes of many mammals. So that the correspondence in general structure, in the minute structure of the tissues, in chemical composition and in constitution, between man and the higher animals, especially the anthropomorphous apes, is extremely close.

Embryonic Development

[Fig. 1. Shows a human embryo, from Ecker, and a dog embryo, from Bischoff. Labelled in each are: a. Fore-brain, cerebral hemispheres, etc. b. Mid-brain, corpora quadrigemina. c. Hind-brain, cerebellum, medulla oblongata. d. Eye. e. Ear. f. First visceral arch. g. Second visceral arch. H. Vertebral columns and muscles in process of development. i. Anterior extremities. K. Posterior extremities. L. Tail or os coccyx.]

Man is developed from an ovule, about the 125th of an inch in diameter, which differs in no respect from the ovules of other animals. The embryo itself at a very early period can hardly be distinguished from that of other members of the vertebrate kingdom. At this period the arteries run in arch-like branches, as if to carry the blood to branchiae which are not present in the higher Vertebrata, though the slits on the sides of the neck still remain (see f, g, fig. 1), marking their former position. At a somewhat later period, when the extremities are developed, "the feet of lizards and mammals," as the illustrious Von Baer remarks, "the wings and feet of birds, no less than the hands and feet of man, all arise from the same fundamental form." It is, says Prof. Huxley (14. 'Man's Place in Nature,' 1863, p. 67.), "quite in the later stages of development that the young human being presents marked differences from the young ape, while the latter departs as much from the dog in its developments, as the man does. Startling as this last assertion may appear to be, it is demonstrably true."

As some of my readers may never have seen a drawing of an embryo, I have given one of man and another of a dog, at about the same early stage of development, carefully copied from two works of undoubted accuracy. (15.The human embryo (upper fig.) is from Ecker, 'Icones Phys.,' 1851-1859, tab. xxx. fig. 2. This embryo was ten lines in length, so that the drawing is much magnified. The embryo of the dog is from Bischoff,'Entwicklungsgeschichte des Hunde-Eies,' 1845, tab. xi. fig. 42B. This drawing is five times magnified, the embryo being twenty-five days old. The internal viscera have been omitted, and the uterine appendages in both drawings removed. I was directed to these figures by Prof. Huxley, from whose work, 'Man's Place in Nature,' the idea of

giving them was taken. Haeckel has also given analogous drawings in his 'Schopfungsgeschichte.')

After the foregoing statements made by such high authorities, it would be superfluous on my part to give a number of borrowed details, shewing that the embryo of man closely resembles that of other mammals. It may, however, be added, that the human embryo likewise resembles certain low forms when adult in various points of structure. For instance, the heart at first exists as a simple pulsating vessel; the excreta are voided through a cloacal passage; and the os coccyx projects like a true tail, "extending considerably beyond the rudimentary legs." (16. Prof. Wyman in 'Proceedings of the American Academy of Sciences,' vol. iv. 1860, p. 17.) In the embryos of all air-breathing vertebrates, certain glands, called the corpora Wolffiana, correspond with, and act like the kidneys of mature fishes. (17. Owen, 'Anatomy of Vertebrates,' vol. i. p. 533.) Even at a later embryonic period, some striking resemblances between man and the lower animals may be observed. Bischoff says that "the convolutions of the brain in a human foetus at the end of the seventh month reach about the same stage of development as in a baboon when adult." (18. 'Die Grosshirnwindungen des Menschen,' 1868, s. 95.) The great toe, as Professor Owen remarks (19. 'Anatomy of Vertebrates,' vol. ii. p. 553.), "which forms the fulcrum when standing or walking, is perhaps the most characteristic peculiarity in the human structure;" but in an embryo, about an inch in length, Prof. Wyman (20. 'Proc. Soc. Nat. Hist.' Boston, 1863, vol. ix. p. 185.) found "that the great toe was shorter than the others; and, instead of being parallel to them, projected at an angle from the side of the foot, thus corresponding with the permanent condition of this part in the quadrumana." I will conclude with a quotation from Huxley (21. 'Man's Place in Nature,' p. 65.) who after asking, does man originate in a different way from a dog, bird, frog or fish? says, "the reply is not doubtful for a moment; without question, the mode of origin, and the early stages of the development of man, are identical with those of the animals immediately below him in the scale: without a doubt in these respects, he is far nearer to apes than the apes are to the dog."

Rudiments

This subject, though not intrinsically more important than the two last, will for several reasons be treated here more fully. (22. I had written a rough copy of this chapter before reading a valuable paper, "Caratteri rudimentali in ordine all' origine dell' uomo" ('Annuario della Soc. d. Naturalisti,' Modena, 1867, p. 81), by G. Canestrini, to which paper I am considerably indebted. Haeckel has given admirable discussions on this whole subject, under the title of Dysteleology, in his 'Generelle Morphologie' and 'Schopfungsgeschichte.') Not one of the higher animals can be named which does not bear some part in a rudimentary condition; and man forms no exception to the rule. Rudimentary organs must be distinguished from those that are nascent; though in some cases the distinction is not easy. The former are either absolutely useless, such as the mammae of male quadrupeds, or the incisor teeth of ruminants which never cut through the gums; or they are of such slight service to their present possessors, that we can hardly suppose that they were developed under the conditions which now exist. Organs in this latter state are not strictly rudimentary, but they are tending in this direction. Nascent organs, on the other hand, though not fully developed, are of high service to their possessors, and are capable of further development. Rudimentary organs are eminently variable; and this is partly intelligible, as they are useless, or nearly useless, and consequently are no longer subjected to natural selection. They often become wholly suppressed. When this occurs, they are nevertheless liable to occasional reappearance through reversion-- a circumstance well worthy of attention.

The chief agents in causing organs to become rudimentary seem to have been disuse at that period of life when the organ is chiefly used (and this is generally during maturity), and also inheritance at a corresponding period of life. The term "disuse" does not relate merely to the lessened action of muscles, but includes a diminished flow of blood to a part or organ, from being subjected to fewer alternations of pressure, or from becoming in any way less habitually active. Rudiments, however, may occur in one sex of those parts which are normally present in the other sex; and such rudiments, as we shall hereafter see, have often originated in a way distinct from those here referred to. In some cases, organs

have been reduced by means of natural selection, from having become injurious to the species under changed habits of life. The process of reduction is probably often aided through the two principles of compensation and economy of growth; but the later stages of reduction, after disuse has done all that can fairly be attributed to it, and when the saving to be effected by the economy of growth would be very small (23. Some good criticisms on this subject have been given by Messrs. Murie and Mivart, in 'Transact. Zoological Society,' 1869, vol. vii. p. 92.), are difficult to understand. The final and complete suppression of a part, already useless and much reduced in size, in which case neither compensation nor economy can come into play, is perhaps intelligible by the aid of the hypothesis of pangenesis. But as the whole subject of rudimentary organs has been discussed and illustrated in my former works (24. 'Variation of Animals and Plants under Domestication,' vol. ii pp. 317 and 397. See also 'Origin of Species,' 5th Edition p. 535.), I need here say no more on this head.

Rudiments of various muscles have been observed in many parts of the human body (25. For instance, M. Richard ('Annales des Sciences Nat.,' 3rd series, Zoolog. 1852, tom. xviii. p. 13) describes and figures rudiments of what he calls the "muscle pedieux de la main," which he says is sometimes "infiniment petit." Another muscle, called "le tibial posterieur," is generally quite absent in the hand, but appears from time to time in a more or less rudimentary condition.); and not a few muscles, which are regularly present in some of the lower animals can occasionally be detected in man in a greatly reduced condition. Every one must have noticed the power which many animals, especially horses, possess of moving or twitching their skin; and this is effected by the panniculus carnosus. Remnants of this muscle in an efficient state are found in various parts of our bodies; for instance, the muscle on the forehead, by which the eyebrows are raised. The platysma myoides, which is well developed on the neck, belongs to this system. Prof. Turner, of Edinburgh, has occasionally detected, as he informs me, muscular fasciculi in five different situations, namely in the axillae, near the scapulae, etc., all of which must be referred to the system of the panniculus. He has also shewn (26. Prof. W. Turner, 'Proceedings of the Royal Society of Edinburgh,' 1866-67, p. 65.) that the musculus

sternalis or sternalis brutorum, which is not an extension of the rectus abdominalis, but is closely allied to the panniculus, occurred in the proportion of about three per cent. in upwards of 600 bodies: he adds, that this muscle affords "an excellent illustration of the statement that occasional and rudimentary structures are especially liable to variation in arrangement."

Some few persons have the power of contracting the superficial muscles on their scalps; and these muscles are in a variable and partially rudimentary condition. M. A. de Candolle has communicated to me a curious instance of the long-continued persistence or inheritance of this power, as well as of its unusual development. He knows a family, in which one member, the present head of the family, could, when a youth, pitch several heavy books from his head by the movement of the scalp alone; and he won wagers by performing this feat. His father, uncle, grandfather, and his three children possess the same power to the same unusual degree. This family became divided eight generations ago into two branches; so that the head of the above-mentioned branch is cousin in the seventh degree to the head of the other branch. This distant cousin resides in another part of France; and on being asked whether he possessed the same faculty, immediately exhibited his power. This case offers a good illustration how persistent may be the transmission of an absolutely useless faculty, probably derived from our remote semi-human progenitors; since many monkeys have, and frequently use the power, of largely moving their scalps up and down. (27. See my 'Expression of the Emotions in Man and Animals,' 1872, p. 144.)

The extrinsic muscles which serve to move the external ear, and the intrinsic muscles which move the different parts, are in a rudimentary condition in man, and they all belong to the system of the panniculus; they are also variable in development, or at least in function. I have seen one man who could draw the whole ear forwards; other men can draw it upwards; another who could draw it backwards (28. Canestrini quotes Hyrtl. ('Annuario della Soc. dei Naturalisti,' Modena, 1867, p. 97) to the same effect.); and from what one of these persons told me, it is probable that most of us, by often touching our ears, and thus directing our attention towards them, could recover some power of movement by repeated trials. The power of erecting and directing the shell of the ears

to the various points of the compass, is no doubt of the highest service to many animals, as they thus perceive the direction of danger; but I have never heard, on sufficient evidence, of a man who possessed this power, the one which might be of use to him. The whole external shell may be considered a rudiment, together with the various folds and prominences (helix and anti-helix, tragus and anti-tragus, etc.) which in the lower animals strengthen and support the ear when erect, without adding much to its weight. Some authors, however, suppose that the cartilage of the shell serves to transmit vibrations to the acoustic nerve; but Mr. Toynbee (29. 'The Diseases of the Ear,' by J. Toynbee, F.R.S., 1860, p. 12. A distinguished physiologist, Prof. Preyer, informs me that he had lately been experimenting on the function of the shell of the ear, and has come to nearly the same conclusion as that given here.), after collecting all the known evidence on this head, concludes that the external shell is of no distinct use. The ears of the chimpanzee and orang are curiously like those of man, and the proper muscles are likewise but very slightly developed. (30. Prof. A. Macalister, 'Annals and Magazine of Natural History,' vol. vii. 1871, p. 342.) I am also assured by the keepers in the Zoological Gardens that these animals never move or erect their ears; so that they are in an equally rudimentary condition with those of man, as far as function is concerned. Why these animals, as well as the progenitors of man, should have lost the power of erecting their ears, we cannot say. It may be, though I am not satisfied with this view, that owing to their arboreal habits and great strength they were but little exposed to danger, and so during a lengthened period moved their ears but little, and thus gradually lost the power of moving them. This would be a parallel case with that of those large and heavy birds, which, from ihabiting oceanic islands, have not been exposed to the attacks of beasts of prey, and have consequently lost the power of using their wings for flight. The inability to move the ears in man and several apes is, however, partly compensated by the freedom with which they can move the head in a horizontal plane, so as to catch sounds from all directions. It has been asserted that the ear of man alone possesses a lobule; but "a rudiment of it is found in the gorilla" (31. Mr. St. George Mivart, 'Elementary Anatomy,' 1873, p. 396.); and, as I hear from Prof. Preyer, it is not rarely absent in the negro.

[Fig. 2. Human Ear, modelled and drawn by Mr. Woolner. The projecting point is labelled a.]

The celebrated sculptor, Mr. Woolner, informs me of one little peculiarity in the external ear, which he has often observed both in men and women, and of which he perceived the full significance. His attention was first called to the subject whilst at work on his figure of Puck, to which he had given pointed ears. He was thus led to examine the ears of various monkeys, and subsequently more carefully those of man. The peculiarity consists in a little blunt point, projecting from the inwardly folded margin, or helix. When present, it is developed at birth, and, according to Prof. Ludwig Meyer, more frequently in man than in woman. Mr. Woolner made an exact model of one such case, and sent me the accompanying drawing. (Fig. 2). These points not only project inwards towards the centre of the ear, but often a little outwards from its plane, so as to be visible when the head is viewed from directly in front or behind. They are variable in size, and somewhat in position, standing either a little higher or lower; and they sometimes occur on one ear and not on the other. They are not confined to mankind, for I observed a case in one of the spider-monkeys (Ateles beelzebuth) in our Zoological Gardens; and Mr. E. Ray Lankester informs me of another case in a chimpanzee in the gardens at Hamburg. The helix obviously consists of the extreme margin of the ear folded inwards; and this folding appears to be in some manner connected with the whole external ear being permanently pressed backwards. In many monkeys, which do not stand high in the order, as baboons and some species of macacus (32. See also some remarks, and the drawings of the ears of the Lemuroidea, in Messrs. Murie and Mivart's excellent paper in 'Transactions of the Zoological Society,' vol. vii. 1869, pp. 6 and 90.), the upper portion of the ear is slightly pointed, and the margin is not at all folded inwards; but if the margin were to be thus folded, a slight point would necessarily project inwards towards the centre, and probably a little outwards from the plane of the ear; and this I believe to be their origin in many cases. On the other hand, Prof. L. Meyer, in an able paper recently published (33. 'Uber das Darwin'sche Spitzohr,' Archiv fur Path. Anat. und Phys., 1871, p. 485.), maintains that the whole case is one of mere variability; and that the projections are not

real ones, but are due to the internal cartilage on each side of the points not having been fully developed. I am quite ready to admit that this is the correct explanation in many instances, as in those figured by Prof. Meyer, in which there are several minute points, or the whole margin is sinuous. I have myself seen, through the kindness of Dr. L. Down, the ear of a microcephalous idiot, on which there is a projection on the outside of the helix, and not on the inward folded edge, so that this point can have no relation to a former apex of the ear. Nevertheless in some cases, my original view, that the points are vestiges of the tips of formerly erect and pointed ears, still seems to me probable. I think so from the frequency of their occurrence, and from the general correspondence in position with that of the tip of a pointed ear. In one case, of which a photograph has been sent me, the projection is so large, that supposing, in accordance with Prof. Meyer's view, the ear to be made perfect by the equal development of the cartilage throughout the whole extent of the margin, it would have covered fully one-third of the whole ear. Two cases have been communicated to me, one in North America, and the other in England, in which the upper margin is not at all folded inwards, but is pointed, so that it closely resembles the pointed ear of an ordinary quadruped in outline. In one of these cases, which was that of a young child, the father compared the ear with the drawing which I have given (34. 'The Expression of the Emotions,' p. 136.) of the ear of a monkey, the Cynopithecus niger, and says that their outlines are closely similar. If, in these two cases, the margin had been folded inwards in the normal manner, an inward projection must have been formed. I may add that in two other cases the outline still remains somewhat pointed, although the margin of the upper part of the ear is normally folded inwards--in one of them, however, very narrowly. [Fig.3. Foetus of an Orang(?). Exact copy of a photograph, shewing the form of the ear at this early age.] The following woodcut (No. 3) is an accurate copy of a photograph of the foetus of an orang (kindly sent me by Dr. Nitsche), in which it may be seen how different the pointed outline of the ear is at this period from its adult condition, when it bears a close general resemblance to that of man. It is evident that the folding over of the tip of such an ear, unless it changed greatly during its further development, would give rise to a point projecting inwards. On the whole, it still seems to me probable that the points in

question are in some cases, both in man and apes, vestiges of a former condition.

The nictitating membrane, or third eyelid, with its accessory muscles and other structures, is especially well developed in birds, and is of much functional importance to them, as it can be rapidly drawn across the whole eye-ball. It is found in some reptiles and amphibians, and in certain fishes, as in sharks. It is fairly well developed in the two lower divisions of the mammalian series, namely, in the monotremata and marsupials, and in some few of the higher mammals, as in the walrus. But in man, the quadrumana, and most other mammals, it exists, as is admitted by all anatomists, as a mere rudiment, called the semilunar fold. (35. Muller's 'Elements of Physiology,' Eng. translat. 1842, vol. ii. p. 1117. Owen, 'Anatomy of Vertebrates,' vol. iii. p. 260; ibid. on the Walrus, 'Proceedings of the Zoological Society,' November 8, 1854. See also R. Knox, 'Great Artists and Anatomists,' p. 106. This rudiment apparently is somewhat larger in Negroes and Australians than in Europeans, see Carl Vogt, 'Lectures on Man,' Eng. translat. p. 129.)

The sense of smell is of the highest importance to the greater number of mammals--to some, as the ruminants, in warning them of danger; to others, as the Carnivora, in finding their prey; to others, again, as the wild boar, for both purposes combined. But the sense of smell is of extremely slight service, if any, even to the dark coloured races of men, in whom it is much more highly developed than in the white and civilised races. (36. The account given by Humboldt of the power of smell possessed by the natives of South America is well known, and has been confirmed by others. M. Houzeau ('Etudes sur les Facultes Mentales,' etc., tom. i. 1872, p. 91) asserts that he repeatedly made experiments, and proved that Negroes and Indians could recognise persons in the dark by their odour. Dr. W. Ogle has made some curious observations on the connection between the power of smell and the colouring matter of the mucous membrane of the olfactory region as well as of the skin of the body. I have, therefore, spoken in the text of the dark-coloured races having a finer sense of smell than the white races. See his paper, 'Medico-Chirurgical Transactions,' London, vol. liii. 1870, p. 276.) Nevertheless it does not warn them of danger, nor

guide them to their food; nor does it prevent the Esquimaux from sleeping in the most fetid atmosphere, nor many savages from eating half-putrid meat. In Europeans the power differs greatly in different individuals, as I am assured by an eminent naturalist who possesses this sense highly developed, and who has attended to the subject. Those who believe in the principle of gradual evolution, will not readily admit that the sense of smell in its present state was originally acquired by man, as he now exists. He inherits the power in an enfeebled and so far rudimentary condition, from some early progenitor, to whom it was highly serviceable, and by whom it was continually used. In those animals which have this sense highly developed, such as dogs and horses, the recollection of persons and of places is strongly associated with their odour; and we can thus perhaps understand how it is, as Dr. Maudsley has truly remarked (37. 'The Physiology and Pathology of Mind,' 2nd ed. 1868, p. 134.), that the sense of smell in man "is singularly effective in recalling vividly the ideas and images of forgotten scenes and places."

Man differs conspicuously from all the other primates in being almost naked. But a few short straggling hairs are found over the greater part of the body in the man, and fine down on that of the woman. The different races differ much in hairiness; and in the individuals of the same race the hairs are highly variable, not only in abundance, but likewise in position: thus in some Europeans the shoulders are quite naked, whilst in others they bear thick tufts of hair. (38. Eschricht, Uber die Richtung der Haare am menschlichen Korper, Muller's 'Archiv fur Anat. und Phys.' 1837, s. 47. I shall often have to refer to this very curious paper.) There can be little doubt that the hairs thus scattered over the body are the rudiments of the uniform hairy coat of the lower animals. This view is rendered all the more probable, as it is known that fine, short, and pale-coloured hairs on the limbs and other parts of the body, occasionally become developed into "thickset, long, and rather coarse dark hairs," when abnormally nourished near old-standing inflamed surfaces. (39. Paget, 'Lectures on Surgical Pathology,' 1853, vol. i. p. 71.)

I am informed by Sir James Paget that often several members of a family have a few hairs in their eyebrows much longer than the others;

so that even this slight peculiarity seems to be inherited. These hairs, too, seem to have their representatives; for in the chimpanzee, and in certain species of Macacus, there are scattered hairs of considerable length rising from the naked skin above the eyes, and corresponding to our eyebrows; similar long hairs project from the hairy covering of the superciliary ridges in some baboons.

The fine wool-like hair, or so-called lanugo, with which the human foetus during the sixth month is thickly covered, offers a more curious case. It is first developed, during the fifth month, on the eyebrows and face, and especially round the mouth, where it is much longer than that on the head. A moustache of this kind was observed by Eschricht (40. Eschricht, ibid. s. 40, 47.) on a female foetus; but this is not so surprising a circumstance as it may at first appear, for the two sexes generally resemble each other in all external characters during an early period of growth. The direction and arrangement of the hairs on all parts of the foetal body are the same as in the adult, but are subject to much variability. The whole surface, including even the forehead and ears, is thus thickly clothed; but it is a significant fact that the palms of the hands and the soles of the feet are quite naked, like the inferior surfaces of all four extremities in most of the lower animals. As this can hardly be an accidental coincidence, the woolly covering of the foetus probably represents the first permanent coat of hair in those mammals which are born hairy. Three or four cases have been recorded of persons born with their whole bodies and faces thickly covered with fine long hairs; and this strange condition is strongly inherited, and is correlated with an abnormal condition of the teeth. (41. See my 'Variation of Animals and Plants under Domestication,' vol. ii. p. 327. Prof. Alex. Brandt has recently sent me an additional case of a father and son, born in Russia, with these peculiarities. I have received drawings of both from Paris.) Prof. Alex. Brandt informs me that he has compared the hair from the face of a man thus characterised, aged thirty-five, with the lanugo of a foetus, and finds it quite similar in texture; therefore, as he remarks, the case may be attributed to an arrest of development in the hair, together with its continued growth. Many delicate children, as I have been assured by a surgeon to a hospital for children, have their

backs covered by rather long silky hairs; and such cases probably come under the same head.

It appears as if the posterior molar or wisdom-teeth were tending to become rudimentary in the more civilised races of man. These teeth are rather smaller than the other molars, as is likewise the case with the corresponding teeth in the chimpanzee and orang; and they have only two separate fangs. They do not cut through the gums till about the seventeenth year, and I have been assured that they are much more liable to decay, and are earlier lost than the other teeth; but this is denied by some eminent dentists. They are also much more liable to vary, both in structure and in the period of their development, than the other teeth. (42. Dr. Webb, 'Teeth in Man and the Anthropoid Apes,' as quoted by Dr. C. Carter Blake in Anthropological Review, July 1867, p. 299.) In the Melanian races, on the other hand, the wisdom-teeth are usually furnished with three separate fangs, and are generally sound; they also differ from the other molars in size, less than in the Caucasian races. (43. Owen, 'Anatomy of Vertebrates,' vol. iii. pp. 320, 321, and 325.) Prof. Schaaffhausen accounts for this difference between the races by "the posterior dental portion of the jaw being always shortened" in those that are civilised (44. 'On the Primitive Form of the Skull,' Eng. translat., in 'Anthropological Review,' Oct. 1868, p. 426), and this shortening may, I presume, be attributed to civilised men habitually feeding on soft, cooked food, and thus using their jaws less. I am informed by Mr. Brace that it is becoming quite a common practice in the United States to remove some of the molar teeth of children, as the jaw does not grow large enough for the perfect development of the normal number. (45. Prof. Montegazza writes to me from Florence, that he has lately been studying the last molar teeth in the different races of man, and has come to the same conclusion as that given in my text, viz., that in the higher or civilised races they are on the road towards atrophy or elimination.)

With respect to the alimentary canal, I have met with an account of only a single rudiment, namely the vermiform appendage of the caecum. The caecum is a branch or diverticulum of the intestine, ending in a cul-de-sac, and is extremely long in many of the lower vegetable-feeding mammals. In the marsupial koala it is actually more than thrice as

long as the whole body. (46. Owen, 'Anatomy of Vertebrates,' vol. iii. pp. 416, 434, 441.) It is sometimes produced into a long gradually-tapering point, and is sometimes constricted in parts. It appears as if, in consequence of changed diet or habits, the caecum had become much shortened in various animals, the vermiform appendage being left as a rudiment of the shortened part. That this appendage is a rudiment, we may infer from its small size, and from the evidence which Prof. Canestrini (47. 'Annuario della Soc. d. Nat.' Modena, 1867, p. 94.) has collected of its variability in man. It is occasionally quite absent, or again is largely developed. The passage is sometimes completely closed for half or two-thirds of its length, with the terminal part consisting of a flattened solid expansion. In the orang this appendage is long and convoluted: in man it arises from the end of the short caecum, and is commonly from four to five inches in length, being only about the third of an inch in diameter. Not only is it useless, but it is sometimes the cause of death, of which fact I have lately heard two instances: this is due to small hard bodies, such as seeds, entering the passage, and causing inflammation. (48. M. C. Martins ("De l'Unite Organique," in 'Revue des Deux Mondes,' June 15, 1862, p. 16) and Haeckel ('Generelle Morphologie,' B. ii. s. 278), have both remarked on the singular fact of this rudiment sometimes causing death.)

In some of the lower Quadrumana, in the Lemuridae and Carnivora, as well as in many marsupials, there is a passage near the lower end of the humerus, called the supra-condyloid foramen, through which the great nerve of the fore limb and often the great artery pass. Now in the humerus of man, there is generally a trace of this passage, which is sometimes fairly well developed, being formed by a depending hook-like process of bone, completed by a band of ligament. Dr. Struthers (49. With respect to inheritance, see Dr. Struthers in the 'Lancet,' Feb. 15, 1873, and another important paper, ibid. Jan. 24, 1863, p. 83. Dr. Knox, as I am informed, was the first anatomist who drew attention to this peculiar structure in man; see his 'Great Artists and Anatomists,' p. 63. See also an important memoir on this process by Dr. Gruber, in the 'Bulletin de l'Acad. Imp. de St. Petersbourg,' tom. xii. 1867, p. 448.), who has closely attended to the subject, has now shewn that this peculiarity is sometimes inherited, as it has occurred in a father,

and in no less than four out of his seven children. When present, the great nerve invariably passes through it; and this clearly indicates that it is the homologue and rudiment of the supra-condyloid foramen of the lower animals. Prof. Turner estimates, as he informs me, that it occurs in about one per cent. of recent skeletons. But if the occasional development of this structure in man is, as seems probable, due to reversion, it is a return to a very ancient state of things, because in the higher Quadrumana it is absent.

There is another foramen or perforation in the humerus, occasionally present in man, which may be called the inter-condyloid. This occurs, but not constantly, in various anthropoid and other apes (50. Mr. St. George Mivart, 'Transactions Phil. Soc.' 1867, p. 310.), and likewise in many of the lower animals. It is remarkable that this perforation seems to have been present in man much more frequently during ancient times than recently. Mr. Busk (51. "On the Caves of Gibraltar," 'Transactions of the International Congress of Prehistoric Archaeology,' Third Session, 1869, p. 159. Prof. Wyman has lately shewn (Fourth Annual Report, Peabody Museum, 1871, p. 20), that this perforation is present in thirty-one per cent. of some human remains from ancient mounds in the Western United States, and in Florida. It frequently occurs in the negro.) has collected the following evidence on this head: Prof. Broca "noticed the perforation in four and a half per cent. of the arm-bones collected in the 'Cimetiere du Sud,' at Paris; and in the Grotto of Orrony, the contents of which are referred to the Bronze period, as many as eight humeri out of thirty-two were perforated; but this extraordinary proportion, he thinks, might be due to the cavern having been a sort of 'family vault.' Again, M. Dupont found thirty per cent. of perforated bones in the caves of the Valley of the Lesse, belonging to the Reindeer period; whilst M. Leguay, in a sort of dolmen at Argenteuil, observed twenty-five per cent. to be perforated; and M. Pruner-Bey found twenty-six per cent. in the same condition in bones from Vaureal. Nor should it be left unnoticed that M. Pruner-Bey states that this condition is common in Guanche skeletons." It is an interesting fact that ancient races, in this and several other cases, more frequently present structures which resemble those of the lower animals than do the modern. One

chief cause seems to be that the ancient races stand somewhat nearer in the long line of descent to their remote animal-like progenitors.

In man, the os coccyx, together with certain other vertebrae hereafter to be described, though functionless as a tail, plainly represent this part in other vertebrate animals. At an early embryonic period it is free, and projects beyond the lower extremities; as may be seen in the drawing (Fig. 1.) of a human embryo. Even after birth it has been known, in certain rare and anomalous cases (52. Quatrefages has lately collected the evidence on this subject. 'Revue des Cours Scientifiques,' 1867-1868, p. 625. In 1840 Fleischmann exhibited a human foetus bearing a free tail, which, as is not always the case, included vertebral bodies; and this tail was critically examined by the many anatomists present at the meeting of naturalists at Erlangen (see Marshall in Niederlandischen Archiv fur Zoologie, December 1871).), to form a small external rudiment of a tail. The os coccyx is short, usually including only four vertebrae, all anchylosed together: and these are in a rudimentary condition, for they consist, with the exception of the basal one, of the centrum alone. (53. Owen, 'On the Nature of Limbs,' 1849, p. 114.) They are furnished with some small muscles; one of which, as I am informed by Prof. Turner, has been expressly described by Theile as a rudimentary repetition of the extensor of the tail, a muscle which is so largely developed in many mammals.

The spinal cord in man extends only as far downwards as the last dorsal or first lumbar vertebra; but a thread-like structure (the filum terminale) runs down the axis of the sacral part of the spinal canal, and even along the back of the coccygeal bones. The upper part of this filament, as Prof. Turner informs me, is undoubtedly homologous with the spinal cord; but the lower part apparently consists merely of the pia mater, or vascular investing membrane. Even in this case the os coccyx may be said to possess a vestige of so important a structure as the spinal cord, though no longer enclosed within a bony canal. The following fact, for which I am also indebted to Prof. Turner, shews how closely the os coccyx corresponds with the true tail in the lower animals: Luschka has recently discovered at the extremity of the coccygeal bones a very peculiar convoluted body, which is continuous with the middle sacral artery; and this discovery led Krause and Meyer to examine the tail of a

monkey (Macacus), and of a cat, in both of which they found a similarly convoluted body, though not at the extremity.

The reproductive system offers various rudimentary structures; but these differ in one important respect from the foregoing cases. Here we are not concerned with the vestige of a part which does not belong to the species in an efficient state, but with a part efficient in the one sex, and represented in the other by a mere rudiment. Nevertheless, the occurrence of such rudiments is as difficult to explain, on the belief of the separate creation of each species, as in the foregoing cases. Hereafter I shall have to recur to these rudiments, and shall shew that their presence generally depends merely on inheritance, that is, on parts acquired by one sex having been partially transmitted to the other. I will in this place only give some instances of such rudiments. It is well known that in the males of all mammals, including man, rudimentary mammae exist. These in several instances have become well developed, and have yielded a copious supply of milk. Their essential identity in the two sexes is likewise shewn by their occasional sympathetic enlargement in both during an attack of the measles. The vesicula prostatica, which has been observed in many male mammals, is now universally acknowledged to be the homologue of the female uterus, together with the connected passage. It is impossible to read Leuckart's able description of this organ, and his reasoning, without admitting the justness of his conclusion. This is especially clear in the case of those mammals in which the true female uterus bifurcates, for in the males of these the vesicula likewise bifurcates. (54. Leuckart, in Todd's 'Cyclopaedia of Anatomy' 1849-52, vol. iv. p. 1415. In man this organ is only from three to six lines in length, but, like so many other rudimentary parts, it is variable in development as well as in other characters.) Some other rudimentary structures belonging to the reproductive system might have been here adduced. (55. See, on this subject, Owen, 'Anatomy of Vertebrates,' vol. iii. pp. 675, 676, 706.)

The bearing of the three great classes of facts now given is unmistakeable. But it would be superfluous fully to recapitulate the line of argument given in detail in my 'Origin of Species.' The homological construction of the whole frame in the members of the same class is intelligible, if we admit their descent from a common progenitor, together with their

subsequent adaptation to diversified conditions. On any other view, the similarity of pattern between the hand of a man or monkey, the foot of a horse, the flipper of a seal, the wing of a bat, etc., is utterly inexplicable. (56. Prof. Bianconi, in a recently published work, illustrated by admirable engravings ('La Theorie Darwinienne et la creation dite independante,' 1874), endeavours to shew that homological structures, in the above and other cases, can be fully explained on mechanical principles, in accordance with their uses. No one has shewn so well, how admirably such structures are adapted for their final purpose; and this adaptation can, as I believe, be explained through natural selection. In considering the wing of a bat, he brings forward (p. 218) what appears to me (to use Auguste Comte's words) a mere metaphysical principle, namely, the preservation "in its integrity of the mammalian nature of the animal." In only a few cases does he discuss rudiments, and then only those parts which are partially rudimentary, such as the little hoofs of the pig and ox, which do not touch the ground; these he shews clearly to be of service to the animal. It is unfortunate that he did not consider such cases as the minute teeth, which never cut through the jaw in the ox, or the mammae of male quadrupeds, or the wings of certain beetles, existing under the soldered wing-covers, or the vestiges of the pistil and stamens in various flowers, and many other such cases. Although I greatly admire Prof. Bianconi's work, yet the belief now held by most naturalists seems to me left unshaken, that homological structures are inexplicable on the principle of mere adaptation.) It is no scientific explanation to assert that they have all been formed on the same ideal plan. With respect to development, we can clearly understand, on the principle of variations supervening at a rather late embryonic period, and being inherited at a corresponding period, how it is that the embryos of wonderfully different forms should still retain, more or less perfectly, the structure of their common progenitor. No other explanation has ever been given of the marvellous fact that the embryos of a man, dog, seal, bat, reptile, etc., can at first hardly be distinguished from each other. In order to understand the existence of rudimentary organs, we have only to suppose that a former progenitor possessed the parts in question in a perfect state, and that under changed habits of life they became greatly reduced, either from simple disuse, or through the natural selection of

those individuals which were least encumbered with a superfluous part, aided by the other means previously indicated.

Thus we can understand how it has come to pass that man and all other vertebrate animals have been constructed on the same general model, why they pass through the same early stages of development, and why they retain certain rudiments in common. Consequently we ought frankly to admit their community of descent: to take any other view, is to admit that our own structure, and that of all the animals around us, is a mere snare laid to entrap our judgment. This conclusion is greatly strengthened, if we look to the members of the whole animal series, and consider the evidence derived from their affinities or classification, their geographical distribution and geological succession. It is only our natural prejudice, and that arrogance which made our forefathers declare that they were descended from demi-gods, which leads us to demur to this conclusion. But the time will before long come, when it will be thought wonderful that naturalists, who were well acquainted with the comparative structure and development of man, and other mammals, should have believed that each was the work of a separate act of creation.

Chapter II

On the Manner of Development of Man from Some Lower Form

Variability of body and mind in man--Inheritance--Causes of variability--Laws of variation the same in man as in the lower animals--Direct action of the conditions of life--Effects of the increased use and disuse of parts--Arrested development--Reversion--Correlated variation--Rate of increase--Checks to increase--Natural selection--Man the most dominant animal in the world--Importance of his corporeal structure--The causes which have led to his becoming erect--Consequent changes of structure--Decrease in size of the canine teeth--Increased size and altered shape of the skull--Nakedness--Absence of a tail--Defenceless condition of man.

It is manifest that man is now subject to much variability. No two individuals of the same race are quite alike. We may compare millions of faces, and each will be distinct. There is an equally great amount of diversity in the proportions and dimensions of the various parts of the body; the length of the legs being one of the most variable points. (1. 'Investigations in Military and Anthropological Statistics of American Soldiers,' by B.A. Gould, 1869, p. 256.) Although in some quarters of