

**The Descent of Man and Selection
in Relation to Sex**

by

Charles Darwin

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Preface To The Second Edition

During the successive reprints of the first edition of this work, published in 1871, I was able to introduce several important corrections; and now that more time has elapsed, I have endeavoured to profit by the fiery ordeal through which the book has passed, and have taken advantage of all the criticisms which seem to me sound. I am also greatly indebted to a large number of correspondents for the communication of a surprising number of new facts and remarks. These have been so numerous, that I have been able to use only the more important ones; and of these, as well as of the more important corrections, I will append a list. Some new illustrations have been introduced, and four of the old drawings have been replaced by better ones, done from life by Mr. T.W. Wood. I must especially call attention to some observations which I owe to the kindness of Prof. Huxley (given as a supplement at the end of Part I.), on the nature of the differences between the brains of man and the higher apes. I have been particularly glad to give these observations, because during the last few years several memoirs on the subject have appeared on the Continent, and their importance has been, in some cases, greatly exaggerated by popular writers.

I may take this opportunity of remarking that my critics frequently assume that I attribute all changes of corporeal structure and mental power exclusively to the natural selection of such variations as are often called spontaneous; whereas, even in the first edition of the 'Origin of Species,' I distinctly stated that great weight must be attributed to the inherited effects of use and disuse, with respect both to the body and mind. I also attributed some amount of modification to the direct and prolonged action of changed conditions of life. Some allowance, too, must be made for occasional reversions of structure; nor must we forget what I have called "correlated" growth, meaning, thereby, that various parts of the organisation are in some unknown manner so connected, that when one part varies, so do others; and if variations in the one are accumulated by selection, other parts will be modified. Again, it has been said by several critics, that when I found that many details of structure in man could not be explained through natural selection, I invented sexual selection; I gave, however, a tolerably clear sketch of this principle in the first edition of the 'Origin of Species,' and I there stated that it was applicable to man. This subject of sexual selection has been treated at full length in the present work, simply because an opportunity was here first afforded me. I have been struck with the likeness of many of the half-favourable criticisms on sexual selection, with those which appeared at first on natural selection; such as, that it would explain some few details, but certainly was not applicable to the extent to which I have employed it. My conviction of the power of sexual selection remains unshaken; but it is probable, or almost certain, that several of my conclusions will hereafter be found erroneous; this can hardly fail to be the case in the first treatment of a subject. When naturalists have become familiar with the idea of sexual selection, it will, as I believe, be much more largely accepted; and it has already been fully and favourably received by several capable judges.

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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 über 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.

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 minimales. 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 Säugethiere 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 *Phaseolartus 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.

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.

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