

Comparative Anatomy, Anthropology and Archaeology as Case Studies on the Influence of Human Biases in Natural Sciences: The Origin of ‘Humans’, of ‘Behaviorally Modern Humans’ and of ‘Fully Civilized Humans’

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Abstract: Natural sciences are considered to be exact sciences. However, despite usually being effectively usually more ‘objective’ than for instance social sciences, they are not immune to a problem common to all sciences: the intrinsic psychological, sociological and/or historical biases of the scientists. In the present paper I will briefly discuss the influence of these biases in natural sciences, using anthropology, archaeology and comparative anatomy as case studies. I will specifically discuss how these influences have lead scientists to ‘actively search’ and supposedly ‘find’ data to support that the first ‘humans’, the first ‘behaviorally modern humans’ and the first ‘fully civilized or sophisticated humans’ were mostly originated in Europe, in some cases to the extent of fabricating false scientific evidence.

Keywords: Anthropology, archaeology, biases, comparative anatomy, cultural revolution, facial expressions, human evolution, palaeolithic archaeology, piltdown hoax.

INTRODUCTION

The natural sciences, as well as sciences such as mathematics and the so-called applied sciences (e.g., computing technology, electronics, engineering) are considered to be exact sciences, because they refer to systematized knowledge based on predictions and their verification by measurement experiments, observations and/or rigorous logical arguments (e.g., [1]). They are distinguished from the so-called social sciences, humanities, theology and arts, for instance, because their experimentation is, at least in theory, feasible and reproducible. In this respect, some fields of research within the natural sciences, and particularly those related with the study of biological/human evolution and archaeology, are sometimes attacked for not meeting all the requirements needed to be designated as ‘exact’ sciences (e.g., [1-11]; see below).

Interestingly, various authors have argued that, despite usually being effectively more ‘objective’ than for instance social sciences, the exact sciences are not immune to a problem common to all sciences: the intrinsic psychological, sociological and/or historical biases of the scientists, that is, of human beings. In the last decades, one author was particularly interested and active on the study of the influence of biases in natural sciences: the late Stephen Jay Gould. Interestingly and somewhat paradoxically, Gould was precisely the target of criticisms by other researchers (e.g., [1, 12]), due to his repetitive use of religious and popular themes as analogies to explain scientific issues such as evolutionary parallelisms and convergences or punctuated equilibrium (see, e.g., [13-14], and also [15-17]).

One of Gould’s most famous and elegant analogies regarding the relation between biases and natural sciences, ‘*Cordelia’s dilemma*’, was introduced in his last masterpiece “The Structure of Evolutionary History” [14], and is particularly relevant for the subjects discussed in the present paper and specifically for the ‘cultural revolution’ argument (see below). As noted by Gould, discourses on the high importance and frequency of the so-called ‘evolutionary trends’ have consumed a great part of the research on biological evolution, including human evolution. However, as stressed by him, the importance given to ‘evolutionary trends’ - a psychological comment about our focus of attention - bears no necessary relationship to the relative frequency or casual weight of these ‘trends’ in the natural history of these clades. It seems more related to a main bias: trends tell stories, and evolution is a *narrative* science; Western tradition has always favored *directional tales* of conquest and valour while experiencing great discomfort with aimless undirected evolution [14: p. 936-937]. Thus, the high importance usually given to evolutionary trends could be more likely explained by a historical bias of nonreporting undirected evolution under the belief that this represents ‘no interesting data’ for evolution. According to Gould, such an historical bias is often seen, for example, in palaeontological publications, in which examples of stasis are often nonreported under the conviction that such stability represents “no data”. These biases were thus compared by this author with ‘*Cordelia’s dilemma*’, in order to “memorialise the plight of King Lear’s honest but rejected daughter”: “when asked by Lear for a fulsome protestation of love in order to secure her inheritance, Cordelia, disgusted by the false and exaggerated speeches of her sisters Goneril and Regan, chose to say nothing, for she knew that ‘my love’s more ponderous than my tongue’; but Lear mistook her silence for hatred or indifference, and cut her off entirely (with tragic consequences later manifested in his own

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madness, blindness, and death), in proclaiming that ‘nothing will come of nothing’ “ [14: p. 764-765]. Cordelia’s dilemma, thus, arises in science when an important signal is not seen or reported at all because scientists read the existing pattern as ‘no data’, literally as nothing at all. Therefore, Cordelia’s dilemma applies not only to biases related to the study of evolutionary trends per se, but to all scientific research in general.

A particularly influential book of Gould that is precisely focused on the main subject of the present work is “The Mismeasure of Man” [18]. In that book, Gould uses his deep knowledge of statistics to review the data that were originally used in the 19th and 20th centuries to defend the supposed existence of, and marked differences between, ‘human races’. He shows that a direct, detailed review of the data does not support at all the racist ideas that were, at that time, accepted by most researchers, and surely does not support that ‘whites’/‘Europeans’ were anatomically or psychologically ‘superior’ to ‘other’ humans. That is, it was not the data, but instead the human biases, that were responsible for creating, and maintaining, those racist ideas.

In part due to Gould’s works, the relation between natural sciences, ‘objectivity’ and human biases has long interested me (e.g., [15-17]). In the last years, during my bibliographical researches on comparative anatomy and human evolution, I was particularly struck to learn the clear relation between the rise of eugenism, particularly in the end of the 19th century and the first decades of the 20th century, and the ‘results’ of so-called ‘racial comparative works’ showing a supposedly profound difference between the anatomy of various groups of humans, and specifically between the so-called ‘Europeans and/or whites’ and ‘other’ humans. Interestingly, I found a parallelism between the Eurocentrism of these works and the Eurocentrism found in some archaeological studies claiming that ‘modern human behaviors’ arose suddenly, and nearly simultaneously during a ‘cultural revolution’, mostly in Europe, about 50-40 thousand years ago (ka). In the present paper I will thus discuss the influence of human biases in natural sciences, using anthropology, archaeology and comparative anatomy as case studies. I will specifically discuss how these influences have led scientists to ‘actively search’ and supposedly ‘find’ data to support that the first ‘humans’, the first ‘behaviorally modern humans’ and the first ‘fully civilized humans’ mostly originated in Europe, in some cases even at the cost of fabricating false scientific evidence. More than discussing in detail all the information that has been published on this subject in previous archaeological, anthropological and anatomical works, the original contribution of the present work is to address this subject in a broader, multidisciplinary context, by reviewing and discussing some illustrative examples taken from these disciplines.

EUROCENTRISM, ETHNOCENTRISM, AND THE ORIGIN OF THE FIRST ‘HUMANS’

One of the most famous examples of the influences of human biases in natural sciences concerns the ‘Piltdown man’ hoax. This case has been extensively discussed in the literature, and I will provide here just a short discussion of its

importance in the context of the main subject discussed in the present work.

The ‘Piltdown man’ includes two fragments, a skull and a mandible, collected in 1912 by C. Dawson from a gravel pit at Piltdown, in England (Fig. 1). The fragments were interpreted by many researchers as fossilized remains of an early ‘human’, which was named *Eoanthropus dawsoni*, or ‘Dawson’s dawn-man’ (e.g., [19-22]). The fragments had a strong impact on the scientific community of that time, leading researchers to consider that the human brain expanded in size before the jaw became adapted to new types of food. And, more importantly for the subject being analyzed in the present work, that Europe played a central role in the origin of the ‘first humans’ (e.g., [19-22]).



Fig. (1). ‘Piltdown or Dawn Man’ skull as reconstructed by J. Woodworth in 1912. A later reconstruction by A. Keith extended the cranial capacity by a further 30-40 percent over this original model (modified from Blinderman 1986 [21]).

What is particularly remarkable about this case is that, although there was some controversy about the specimen, the ultimate revelation that it was a forgery that combined an orangutan mandible and a human skull of medieval age occurred only in 1953 (e.g., [19-21]). That is, during more than 40 years, some of the most respected scientists at the time preferred to see the European ‘Piltdown man’ as a more ‘plausible’ link between modern humans and non-human primates than the African ‘Taung child’ described by Dart [23] (which is now consensually accepted as a valid specimen of the early human species *Australopithecus africanus*). According to authors such as Gould [19], this is likely related to the influence of a major human bias on those scientists, and, probably, of the author of the forgery (its identity has been, and continues to be, the subject of much controversy): an Eurocentric bias to see Europe as the center of origin of humanity. Evidence accumulated in the last decades clearly supports the idea, however, that the first ‘humans’ (i.e. the first hominins sensu Wood [24]) originated in Africa more than 6 millions years ago (see e.g., [22-25]), not in Europe.

EUROCENTRISM, ETHNOCENTRISM, AND THE ORIGIN OF ‘BEHAVIORALLY MODERN HUMANS’

During a longtime, the most predominant view in archaeology was that ‘modern human behavior’ was the result of a somewhat abrupt ‘cultural revolution’ occurred at

about 50-40 ka, and that Europe played a central role in this ‘revolution’ (e.g., [22]). In fact, one can say that this view was mainly predominant until only about two decades ago, being the view defended in most general and scholarly textbooks. This view was, in a certain way, quite comfortable for the European/Western media and public. The evidence accumulated during the 20th century contradicted the idea that Europe was the center of origin of the first members of our tribe Hominini (i.e., of the first humans, see above), of our genus *Homo*, and of our species *Homo sapiens* (see below). However, the Western world, and namely Europe, could still be proud of being the main center of origin of ‘modern human behavior’.

But, as explained in Conroy’s [22] updated overview of human evolution, in the last two decades, there has been a major change in our thinking about the origins of behaviorally modern humans (e.g., [26-53]). And, among the many works contributing to this change of paradigm, one was particularly influential: that of McBrearty & Brooks [28].

As explained by McBrearty & Brooks [28], the view that the ‘modern human behavior’ was the result of a ‘cultural revolution’ had its roots in the 19th century probings of the Western European archaeological record. By the 1920s the concept of an European Upper Paleolithic distinguished by the appearance of ‘modern human behaviors’ such as

engraving, sculpture, painting, beads, and worked bone tools had become accepted by many researchers. As stressed by these authors, “perhaps not surprisingly, a picture of Europe conquered by invaders with superior technology had little appeal in the light of two great European wars”, and the trend in archaeology in the second half of the twentieth century was mainly “the study of local sequences and the application of models of cultural evolution” [28: p. 454]. The notion that ‘modern human behavior’ mainly originated in Europe was somewhat related to a certain sense of European/Western superiority: the ‘cultural revolution’ model proposed a dramatic alteration in human behavior and a possible reorganization of the brain, leading to increased cognitive sophistication, the manipulation of symbols, and the origin of language (e.g., [22, 28, 40]). The original and important contribution of McBrearty & Brooks [28] was that they extensively reviewed the archaeological evidence available and clearly pointed out that almost all the behaviors that are considered to represent ‘modern human behaviors’ were, in fact, very likely being displayed by humans in Africa much before 40-50 ka (Fig. 2). Due to limitations of size, I will not review in detail all the archaeological evidence analyzed by McBrearty & Brooks [28], but will focus on some of the more relevant points regarding one of the most important aspects of ‘modern human behavior’: symbolic behavior. The section provided below is thus based on the work of McBrearty and Brooks

Behavioral Innovations of the Middle Stone Age in Africa

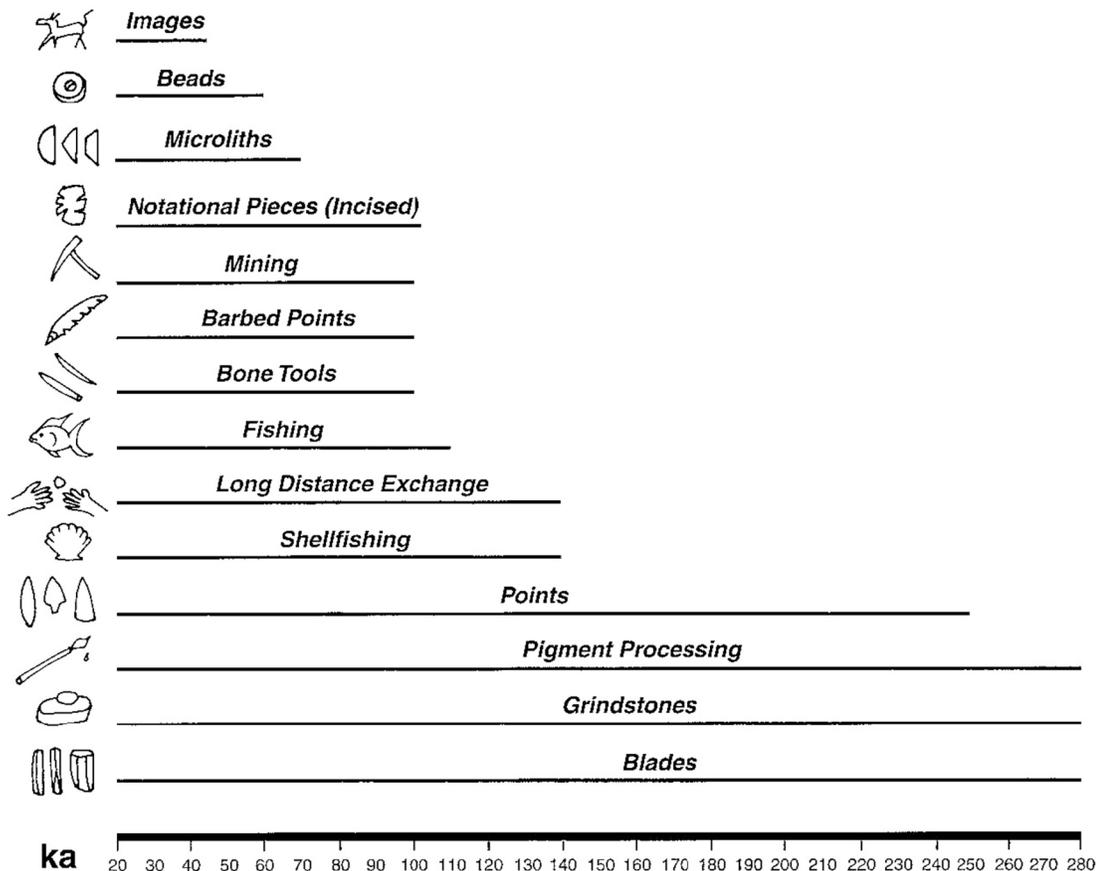


Fig. (2). Modern human behaviors and their time depths in Africa, according to McBrearty and Brooks [28] (modified from McBrearty & Brooks 2000 [28]).

[28], but it also includes information about some new important archaeological findings reported after the publication of that work.

Regarding the special treatment of the dead, McBrearty & Brooks [28: p. 520] consider that the cutmarks on the temporal bone of the Bodo cranium (Ethiopia, ca. 600 ka) indicating defleshing with a stone tool [54] “suggest either cannibalism or a postmortem ritualized treatment of the skull”. In the latter case, this would be the first evidence of a special treatment of the dead in humans. Another controversial finding concerns the human remains recovered from Border Cave, in South Africa, which include a nearly complete infant skeleton interpreted as a deliberate burial (e.g., [55]). There are doubts about the exact provenience of these fossils, but if the interpretation of, and the age estimated (ca 100-90 ka) by, Beaumont *et al.* [55] were correct, the Border cave infant would provide evidence of a human burial realized in Africa much before the so-called ‘cultural revolution’ (ca. 50-40 ka) (e.g., [28]). Other examples of potential evidence of African deliberate human burials before this ‘revolution’ concern the discovery of a complete skeleton of a juvenile found in a seated position with the legs flexed and the head facing upward (ca 80-50 ka, Taramsa, Egypt), and of stone beehiveshaped structures found to contain fragmentary human bones (Mumbwa, Zambia) (see, e.g., [28]). What is important to stress here is that, apart from these controversial findings, there is actually strong, solid evidence of deliberate human burials outside Europe and much before the supposed ‘cultural revolution’: that found in Qafzeh (Israel), where at least four out of as many as 15 individuals (ca. 90-120 ka) represented in the cave are consensually interpreted as deliberate interments, one of them being, inclusively, possibly associated with grave goods (e.g., [22, 28, 40, 56-58]).

Concerning beads and ornaments, a number of ornaments are now known from Aterian sites dating from at least 130 ka to about 40 ka., including a bone pendant from the Grotte Zouhra (Morocco), four deliberately drilled quartzite flakes that were probably designed for use as pendants from Segge'dim (Niger), and a perforated shell from Oued Djebanna (Algeria) (see, e.g., [28]). Some examples of Middle Stone Age African beads listed by McBrearty & Brooks [28] are those reported from the Cave of Hearths, Boomplaas and Bushman Rock Shelter (South Africa), Nswatugi (Zimbabwe), and Mumba Rock Shelter (Tanzania). It should be noted that after the publication of McBrearty & Brooks' [28] work, there were additional findings of Middle Stone Age African beads. One of the most remarkable findings was the recovery from the Blombos site (South Africa) of no less than 41 specimens of carefully seashells (ca 80-75 ka; Fig. 3). These were apparently introduced into the site from estuarine contexts at least 20 km away from the site and, on the basis of microscopic analyses, were intended for suspension from cords or thongs ([35], see also, e.g., [48]). There is thus a growing body of literature supporting the idea that body ornamentation was effectively a frequent practice in Africa, and just a few months ago there was precisely a new report about possible Middle Stone Age shell beads from the Sibudu Cave, in South Africa [44].

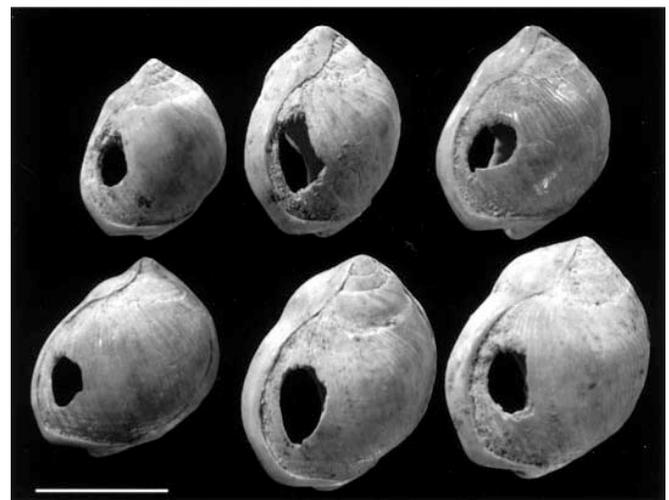
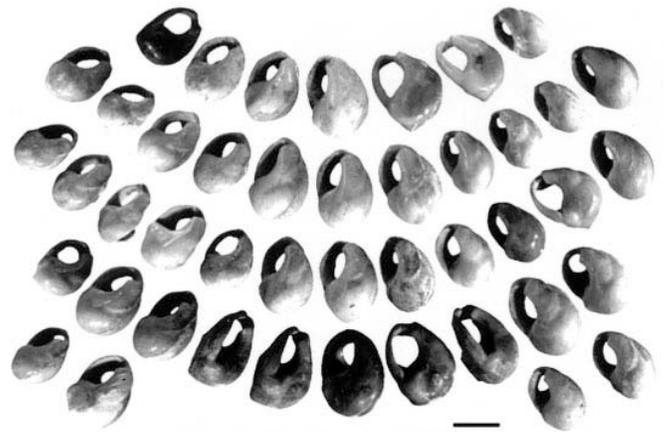


Fig. (3). Perforated shells from the Still Bay levels at Blombos Cave (ca 80-74 ka, South Africa) (modified from Henshilwood *et al.* 2004 [35]).

As for the use of pigments, McBrearty & Brooks [28: p. 525] explain that “the earliest mural rock paintings in Africa have probably long since been lost through exfoliation and the natural collapse of shallow cave systems, and only rare discoveries of buried pieces of painted rock provide an indication of the true antiquity of the tradition”. They state that granite slabs with ochre traces were found at Nswatugi (Zimbabwe), in a late Middle Stone Age (Tshangulan) horizon, and that painted slabs were reported at the Apollo 11 cave (Namibia), also in an MSA horizon stratified above a level containing artifacts with Howiesons Poort affinities (Fig. 4). According to these authors, these painted slabs may be exfoliated from the cave ceiling or, instead, be portable art objects. Radiocarbon dates ranging between 26 ka and 28 ka from the level containing the painted slabs have been reported. But, as stressed by these authors, these young dates are anomalous for material with Middle Stone Age associations, and Miller *et al.* [59] report an age of 59 ka for the Middle Stone Age of the Howiesons Poort at Apollo 11, based on a series of 62 isoleucine epimerization dates on ostrich eggshell.

According to a recent overview by Mellars [48], the occurrence of large quantities of red ochre in the African Middle Stone Age, including over 8,000 pieces from the Still Bay levels at Blombos and many pieces with smoothed facets or deliberately scraped surfaces, implies very likely

their use as coloring pigments. The presence of geometrical designs incised on at least two large pieces of ochre from Blombos seems to confirm their role in certain explicitly symbolic or ceremonial activities. He states that “similar use of ochre is actually abundant in many African Middle Stone Age sites, apparently extending back, at the Twin Rivers site in Zambia and the Kapthurin sites in Kenya, to at least 250,000 before present; whatever significance one may attach to the sporadic occurrence of black manganese dioxide and occasional fragments of ochre at European Mousterian sites, it is clear that the scale of this red ochre use at African sites vastly exceeds that recorded anywhere in Europe prior to the Upper Paleolithic” [48: p. 17]. Before ending this section, it is important to mention one of the most notable archaeological findings done in the last years: the two engraved ochres from the Middle Stone Age levels of Blombos Cave (ca 75 ka, South Africa; Fig. 5). These bone fragments engraved with abstract patterns (e.g., [32-34, 40, 60] are considered by D’Errico *et al.* [41: p. 4] as “the most ancient irrefutable evidence for symbolic behavior”. According to Mellars [48: p. 17], these fragments “are generally recognized as the earliest fully convincing examples of deliberate and repeated design motifs recorded anywhere in the world, certainly exceeding anything at present known from Mousterian or earlier contexts in Europe”. This finding, together with the evidence mentioned in the paragraphs above, shows that there is effectively accumulating evidence supporting the idea that at least some of the behaviors that were usually seen as ‘modern human behaviors’ and associated with the occurrence of a ‘culture revolution’ at about 50-40 ca, were in fact being displayed well before that by humans in Africa (as well as in other non-European regions such as the Levant).

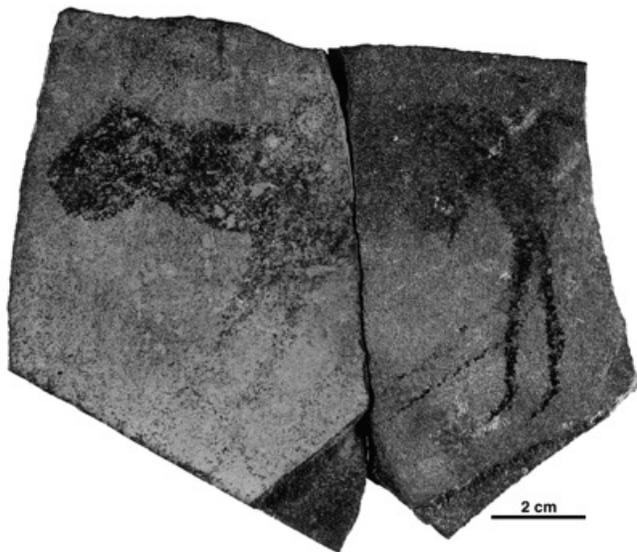


Fig. (4). Painted slab from Middle Stone Age levels at Apollo 11 Rock Shelter (Namibia) (modified from Vogelsang 1998 [90]).

EUROCENTRISM, ETHNOCENTRISM, AND THE ORIGIN OF ‘FULLY CIVILIZED HUMANS’

As explained in the Introduction, during my bibliographical researches on comparative anatomy and human evolution, I was particularly struck by the clear relation between the rise of eugenism, in the last decades of

the 19th century and particularly during the first decades of the 20th century, and the ‘results’ of so-called ‘racial comparative works’ showing supposedly profound differences between the anatomy of various groups of humans, and specifically between the so-called ‘Europeans and/or whites’ and ‘other’ humans. According to the authors of some of these works (e.g., [61-69]), one of the most striking differences between ‘Europeans and/or whites’ and ‘other’ humans referred to an anatomical system that is precisely related to the expression of our more ‘sophisticated and complex’ feelings and emotions and to our communication with others, i.e. to our main ‘window’ with the outside world: the facial musculature. As its name indicates, this musculature is related with the display of facial expressions.

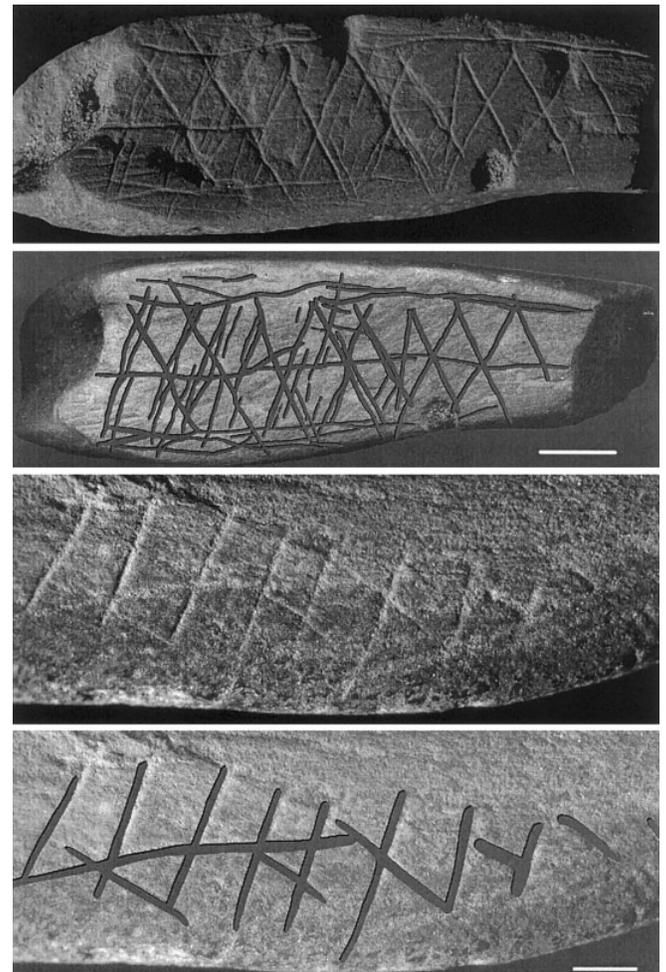


Fig. (5). Engraved ochres from the Middle Stone Age levels of Blombos Cave, ca 75 ka, South Africa, with the tracings of the incised pattern (modified from Henshilwood *et al.* 2002 [34] and D’Errico 2003 [40]).

For the present work, I took the advantage of the online service provided by ‘PubMed’ and systematically analyzed all the issues of the *Journal of Anatomy* (former *Journal of Anatomy and Physiology*) in the last 120 years, as well as other relevant revues, journals and/or books. Interestingly, descriptions of the ‘supposed’ marked differences between the facial muscles of ‘Europeans and/or whites’, on the one hand, and ‘other’ humans and non-human primates, on the other hand, became more and more frequent during the

decades before the II World War. This was confirmed by Huber [68: p. 5], who stated that the “first three decades of the 20th century” were a particularly “active period of racial anatomical research on facial musculature”. That is, this research was particularly active at a time in which eugenism was particularly influential in various countries, contributing to ideas that have led to the II World War (see, e.g., [13, 70-72]; see also Fig. 6).



Fig. (6). An anthropometric device (side view) by Major A.J.N. Tremearne designed “for measuring the living head” for “the use of anthropologists”, invented in 1913 with later additions (modified from Tremearne 1914 [91]).

In the works of eminent and influential comparative anatomists such as Lightoller [61-65], Huber [66-68] and Loth [69], the common view was clearly that some of the facial muscles of ‘European and/or whites’ are not differentiated in non-human primates, and that in many aspects ‘other’ humans have a condition that is more similar to these latter primates than to ‘Europeans and/or whites’. For instance, Lightoller [61: p. 20, 54] stated: “to express this otherwise; in these (non-human) Primates the facial musculature did not differ more from that of the Australian aboriginals than did the facial musculature of these ‘Abos’ (Australian aboriginals) differ from that of the European (humans)”; “as the Australian aboriginal is very primitive his basis modioli has been selected for comparison with these (non-human) Primates”. Loth [69: p. 18] wrote: “the distinct differentiation of the mimetic muscles depends on the facial expression, which in the white men is full of spirit”. He suggested that the risorius, the ‘most characteristic’ facial muscle of humans, absent in most non-human primates, was present in ‘Europeans and/or whites’ and often absent in ‘other’ extant humans [69: p. 42-43]. Huber [68: p. 101] stated: “the facial musculature of the adult American Negro is generally composed of bundles which are much coarser and also darker in color than are those of the White; there is, moreover, in the Negro, a lack of differentiation into well defined individual muscles in some regions of the face; this is particularly striking in the musculature of the mid-face, where in the Negro the marginal bundles of the m. orbicularis are in broad primitive connection with the undifferentiated powerful zygomaticus muscle mass, while in a prevailing percentage of White cases, the zygomaticus musculature has reached a higher stage in evolution” (see Fig. 7). He further stated that “in the reconstruction of the

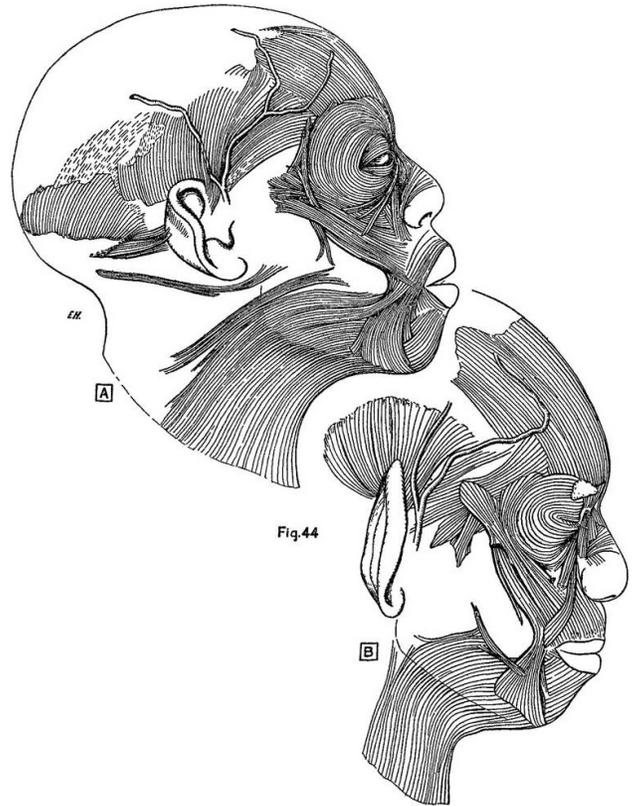


Fig. (7). Drawing of the facial muscles by Huber, showing what he considers to be ‘significant racial differences’ between a so-called ‘adult male negro’ (on the left) and a so-called ‘adult male Australian’ (on the right) (modified from Huber 1930b, 1931 [67-68]).

facial musculature of the Neanderthal man .. the musculature of the mid-face region should certainly be represented as an undifferentiated muscle mass similar to the condition found in the Negro, Papuan and Melanesian, Australian, etc.” [68: p. 115]. Some of Huber’s statements are particularly racist, because they clearly seem to be personal and directly imply that ‘Europeans and/or whites’ are in a ‘higher state of evolution’ than ‘other’ extant humans not only genetically and anatomically, but also psychologically and neurologically: “in the responsive faces of Whites we notice, specially in the upper region of the face and about the mouth, a great range of varied expressions with many modulations; the mouth, even closed, may serve as an admirable index of character or mental state through a slightly increased tonus of its musculature .. the smile turns into a happy, hearty laugh; apparently nerve impulses that are less finely graded reach the respective mimetic muscle groups, thus setting them into sudden, strong contraction which rather suggests more primitive muscle actions (of the ‘negroes’); the expression is characteristic; through the strong ‘labial tractors’, specially through the undifferentiated zygomaticus muscle mass, the bulky lips are vigorously pulled upward and outward, so that the large white teeth show in vivid contrast to the dark face; instead of grades laugh typical of the white we notice the characteristic grinning of the negro, and through sounds, often simultaneously uttered, which differ in tone of voice from those of the white, the negro’s grinning becomes even more characteristic; the Polynesians, like the negroes - a dark

skinned, yet profoundly different somatically and psychologically, a highly intelligent race - show a distinctly different facial expression, very similar to that of the white; I should never forget the intelligent, pleasing and charming features of the kindly Hawaiian faces" [68: p. 159-160].

This is just a very small portion of the numerous quotes that could be cited showing clear cases of ethnocentrism, eurocentrism, racism or eugenism in the late decades of the 19th century and the first decades of the 20th century (for more details about the history of 'racial comparative works' on the facial musculature during these decades, see, e.g., [67-68]). What is more striking is that these quotes were not written by a few, somewhat unknown researchers, but instead by the most eminent, respected and influential researchers working on the comparative anatomy of the facial musculature at that time. And what is interesting is that, in the works of these researchers, the 'European and/or white' humans are often designated as 'civilized' humans, in opposition to the 'other', 'not fully civilized' humans. This use of words clearly stresses that the only 'fully civilized or sophisticated humans' are 'Europeans' or 'European descendants' and, thus, that the origin of 'fully civilized or sophisticated humans' originally occurred in Europe. Interestingly, the works of these researchers actually continue to be among the most respected, most read and most influential publications concerning the comparative anatomy of the facial muscles of non-human primates, nowadays. However, the 'conclusions' of their 'racial comparative studies' have been strongly contradicted by evidence accumulated in the last decades, and are no longer followed by most authors.

On the one hand, numerous anatomical studies, including my own dissections of human and non-human primates, have shown that extant human groups, as well as extant non-human primates such as chimpanzees, usually have the same number of facial muscles (e.g., [73-77]). That is, there are no facial muscles that are present in 'Europeans and/or whites' and missing in all 'other' human and in non-human primates.

On the other hand, numerous studies have shown that all extant human groups are genetically much more similar to each other than to other extant primates, and that the intra-variation within some of these extant human groups is actually more significant than the inter-variation between these groups and other groups of extant humans. A pioneering study was that of Cann *et al.* [78]. These authors undertook the first world-wide survey of mitochondrial DNA (mtDNA), in order to discuss the history of the human gene pool. An important finding of their study was that all of the mtDNA examined, even the samples from far-flung regions of the world, was strikingly similar, suggesting that our species is in fact very young. Also, within the populations included in that study, there was more genetic variation within the sub-Saharan Africans than in the rest of the other populations put together. Based on their results, Cann *et al.* thus argued that Africa is a likely source of the human mitochondrial gene pool and that all the mitochondrial DNAs stem that they have analyzed seemingly comes from a woman (the "Mitochondrial Eve") that, according to their estimates, lived in that continent about 200,000 years ago.

However, as they stressed, this "does not imply that the transformation to anatomically modern *Homo sapiens*

occurred in Africa at this time, since mtDNA data tell us nothing of the contributions to this transformation by the genetic and cultural traits of males and females whose mtDNA became extinct" [78: p. 35]. It is also important to note that more recent publications have shown that Cann *et al.*'s [78] work actually had various theoretical and methodological flaws. For instance, the assumptions that all mtDNA is exclusively inherited by the mother, that the rate of mtDNA substitutions are constant in all human populations, and that there is usually no natural selection on mtDNA, have been contradicted by various empirical studies (see, e.g., [22, 79, 80]). Moreover, when other authors have tried to test the results of Cann *et al.*'s [78] work by coding the molecular characters and/or the different terminal taxa used in that work in a different order, the results obtained were slightly (although not significantly) different from the original ones (see, e.g., [22]). Despite these problems, Cann *et al.*'s [78] work has been, and often continues to be, regarded as a landmark publication supporting the so-called "Out of Africa Model". Therefore, instead of supporting the Eurocentric views of authors such as Lightoller [61-65], Huber [66-68] and Loth [69], the genetic evidence accumulated in the last decades supports the idea that Africa was, once again, the location of another crucial event of human evolution.

Another example of the numerous molecular studies supporting a recent and/or African origin of modern humans is that of Ingman *et al.* [81]. These authors analyzed the complete mtDNA sequence of 53 humans of diverse origins. According to their results, the mtDNA sequence diversity among Africans is more than twice that among non-Africans, thus corroborating previous works such as Cann *et al.* [78]. Also, the contrast between the deep branches of African mtDNAs and the complex phylogeny of non-African mtDNAs suggests that the high African diversity might result from either a considerably larger effective population size or a significantly longer genetic history. They estimated the age of the most recent common ancestor of modern humans to be between about 171,500 and 50,000 years. Similar results were later obtained by authors such as Tishkoff & Verrelli [82], who, based on their own genetic analyses and on a review of the literature, stated that African population samples typically have higher levels of genetic diversity relative to non-African populations.

Due to the results of these and other genetic studies, in the beginning of this decade most molecular biologists, as well as many researchers from other areas, accepted the Out of Africa model over the Multiregional model. Interestingly, in 2002, Templeton [79], based on a statistical analysis of human haplotype trees for mitochondrial DNA, Y-chromosomal DNA, two X-linked regions and six autosomal regions, proposed a new, third model, which he named "Out of Africa Again and Again". According to Templeton, his results strongly supported: 1) the dominant role that Africa has played in shaping the modern human gene pool through at least two major expansions after the original range extension of *Homo erectus* out of that continent; 2) the ubiquity of genetic interchange between human populations, both in terms of recurrent gene flow constrained by geographical distance and of major population expansion events resulting in interbreeding, not replacement. Importantly, he stated that these results falsified both the

“strong” Out of Africa and the “strong” Multiregional models. This because about 90% of the nuclear haplotype trees that were obtained were seemingly rooted in Africa. That is, Africa does seem to have played, again, a central (but not as exclusive as defended in the “strong” Out of Africa model) role in the origin of the gene pool of modern humans. In summary, in view of the anatomical and genetic data accumulated in the last decades, there is no support for the idea that some extant humans are anatomically and/or genetically more similar to some non-human primates than to other extant humans, nor for the idea that Europeans or European descendents are more ‘fully civilized or sophisticated’ than ‘other’ extant humans.

GENERAL REMARKS

As can be seen from the above examples and discussions, natural sciences, and in this particular case anthropology and archaeology, are effectively not immune to the psychological, sociological and/or historical biases that us, as scientists, intrinsically have. In all the three cases discussed in the present paper, there is a clear influence of human biases in so-called ‘exact sciences’ and on the interpretation and knowledge of our own evolution. Interestingly, different biases can influence a same case. For instance, as explained in the Introduction, there is often a human bias, in the field of biological evolution, to see a ‘gradual, progressive, directed’ evolution of organisms, and thus, against the recognition of evolutionary stasis. However, within those works claiming that ‘modern human behavior’ was the product of an abrupt ‘cultural revolution’, the human bias was the opposite: to tend to accept a long evolutionary stasis, mostly in Africa, before that ‘cultural revolution’. Both biases can, in fact, be explained by Gould’s assertion of a broader, more general human bias related to the study of evolution: to see evolution as a *narrative tale*, with an *aim* and a *purpose*. So, in choosing whether there was a ‘gradual progress’ in the acquisition of ‘modern human behavior’ with a significant part of this ‘progress’ being mostly done in Africa or whether there was a ‘long stasis’ in the acquisition of this ‘behavior’ and then a ‘remarkable, abrupt cultural revolution’, mostly done in Europe, many European/Western scientists opted to choose the last option. It is effectively interesting to see how different researchers, at different historical times, were lead to ‘actively search’ and supposedly ‘find’ data to support that the ‘first humans’, the first ‘behaviorally modern humans’ and the first ‘fully civilized humans’ mostly originated in Europe. In some cases even at the cost of fabricating false scientific evidence, as in the case of the ‘Pittdown’ hoax. These examples thus clearly stress how human biases do influence natural sciences, including archaeology. In fact, in relation to the three specific cases discussed above, there is accumulating evidence that the first humans, the first *Homo* and the first ‘behaviorally modern humans’ were very likely not originated in Europe. And there is probably more genetic, and possibly also more anatomical, intra-variation within certain extant human groups than inter-variation between these groups and other groups of extant humans. What is interesting, and somewhat disturbing, is that we, scientists, are all human beings and have our own psychological, sociological and/or historical bias. So, above all, we should keep in mind that the hypotheses that we now consider to be

‘supported by the available evidence’ are just that, scientific hypotheses that need to be reexamined, in a Popperian way, in the light of future evidence. And that at least some of these hypotheses will eventually be contradicted by future evidence or by a re-interpretation of the available evidence, thus reminding us that, as other scientists, we were probably influenced by our own biases and/or the scientific ‘establishment’ when we first interpreted the data and considered that these contradicted hypotheses made all the sense to us.

In fact, in his recent paper “Race - a social construction of a biological concept”, Sesardic [83] argues that the current and politically correct scientific ‘establishment’ is leading to biases that are influencing contemporary philosophers, anthropologists, and psychologists to favor views that are as exactly the opposite to, but as extreme as, the racist and/or eurocentric views discussed in the sections above. Sesardic provides an updated review of some relevant genetic and anatomical works, and argues that, contrary to the view that is often defended in the current literature, the data presented in these works do provide evidence to support that the concept of human races does have a biological reality, and that these races effectively often characterized by a combination of peculiar genetic, anatomical, and even psychological features.

Regarding the genetic evidence, Sesardic [83: p. 148] argues that the data provided by the pioneer studies of Cavalli-Sforza and colleagues (see, e.g., [84, 85], as well as by several other works published in the last decades, “has shown that, indeed, groups of people of significantly different geographical ancestries do differ from one another genetically: when compared on many genetic loci, these groups have different frequencies of different alleles”. According to him, “these differences are the result of these populations being at least partly isolated from one another long enough for a genetic differentiation to develop” [83: p. 148].

Regarding the anatomical evidence, Sesardic [83: p. 155-156] stressed that “forensic anthropologists are quite successful in correctly inferring a person’s race from the skeletal characteristics of human remains”, and that “this prompted one bewildered and exasperated scientist to write an article with a provocative title: If Races Do not Exist, Why Are Forensic Anthropologists So Good at Identifying Them (Sauer 1992 [86])”. For instance, a study that covered 17 populations over the world and that relied on 34 different measurements managed to assign 98% of the specimens to their correct major racial group [87]. According to Sesardic [83: p. 156], “the empirical reality appears to refute decisively the claim so confidently advocated by many philosophers that as the number of traits increases, racial classification becomes increasingly difficult, or that multiplying phenotypic racial traits has the result .. that .. they correlate with one another in no particular order, throwing the alleged features for biological racial reality into an unorganized mess”.

Regarding the psychological evidence, Sesardic [83: p. 158] referred, for instance, to the famous “Yali’s question” raised in Jared Diamond’s book “Guns, Germs and Steel” [88], about the “economic backwardness” of New Guineans. He stated that “Jared Diamond briefly considers a possibility

that a genetic difference in cognitive ability between the two groups might partly account for the observed disparity in their economic development”, “but although most studies indeed put the IQ of New Guineans consistently far below 100 (the white mean), Diamond immediately rejects the genetic hypothesis”, and looks instead for other explanations.

As the subject of this paper is to discuss the influence of humans biases in natural sciences, I should explain that I consider Sesardic’s paper interesting in the sense that he discusses how these biases might be affecting the current views of researchers, the media, and the general public about these delicate subjects. Also, I am against any type of extremist views, and I appreciate the fact that Sesardic criticizes the most extreme views of social constructivists. I agree that at least some groups of modern humans can probably be successfully identified by examining a particular combination of useful features, particularly of genetic markers. However, Sesardic paper has serious limitations. One that is particularly important is that he does not discuss the concept and reality of races in a proper evolutionary and phylogenetic context. When one refers to the reality of races, in a strictly biological definition, one has to refer to evolutionary biology and phylogeny: a group of animals (including humans) can only constitute a race if all its members are phylogenetically more closely related to each other than to members of other groups. However, this is clearly not the case of the so-called “human races” that we read/hear about in most textbooks and in the media. Let’s take the example of “Africans”, or “Blacks”, which, as explained above, have been consistently one of the most discriminated “groups” of modern humans. “Africans” actually not constitute a biologically monophyletic group, i.e. they do not constitute a natural group, as shown in the cladogram obtained in the recent genetic study of Li *et al.* [89], which is just one of several cladograms that could be used here to illustrate this point. As can be clearly seen in this cladogram (Fig. 8), some “Africans”, such as the Bantu, Yoruba and Mandenka are more closely related (genetically and phylogenetically) to “non-Africans” such as Italians or Russians than to other “Africans” or “Blacks” such as the San. That is, in this cladogram “Africans”, appear as a paraphyletic, and not as a monophyletic, group: one would have to exclude the clade including all “non-Africans” in order to obtain a clade including “Africans” only, as one would have to exclude the clade including all birds in order to obtain a clade including “Dinosaurs” only. “Whites”, or “Europeans” do also not constitute a monophyletic group: for instance, in this particular cladogram the Adygei appear as more closely related to people from Asia, the Americas and Oceania than to the remaining people from Europe (Fig. 8). Moreover, “Asians” are also not a monophyletic group: in the cladogram the people from East Asia appear as more closely related to people from the Americas and from Oceania than do other “Asians” (Fig. 8).

This cladogram actually summarizes what I consider to be the current state of the art concerning our knowledge about the relationships of modern humans and the concept of race. As “fish” or “dinosaurs”, “Africans”, “Asians”, and very likely also “Whites” are not real monophyletic, natural

biological groups that can be diagnosed by true biological synapomorphies, being, instead, paraphyletic or polyphyletic groups that can be characterized by a combination of some plesiomorphies and/or homoplastic features (including evolutionary convergences, parallelisms and reversions) such as the color of the skin or the presence of fins. However, it makes sense that, during their isolation, some small and geographically isolated groups of modern humans, such as the indigenous people of New Guinea, have acquired some true genetic and/or anatomical synapomorphies, and that these small groups can be identified, and diagnosed, by these synapomorphies (see Fig. 8). Within this context, one could accept Sesardic’s idea that, together with these anatomical and genetic synapomorphies, at least some of these small isolated groups could also have acquired peculiar psychological synapomorphies, which, in a Western narrative, could theoretically be considered as ‘positive’, ‘negative’, or ‘neutral’. However, the discussion that Sesardic provided on this latter topic is not only simplistic, but also reflects some of the Eurocentric/racist biases that were discussed in the previous sections of the present work. In fact, Sesardic seems to assume that if there are “intrinsic psychological differences” between “whites” and people from regions such as New Guinea, then the “intrinsic psychological peculiarities” of the latter are necessarily “negative” in relation to those of the “whites”. What does Sesardic actually mean by stating that “most studies indeed put the IQ of New Guineans consistently far below 100 (the white mean)”)? And why does Sesardic not provide the references to these “studies”? Which “studies” are these? What is the “white mean”? Does it refer to infant whites, adolescent whites, adult whites, male whites, female whites? From which socioeconomic background? And the New Guineans? Which types of questions were made in these “studies”? Interestingly, Sesardic does also not cite Gould’s book “The Mismeasure of Man” [18], which is one of the most comprehensive books about this subject. Gould shows how the first IQ tests that were implemented in the US had a political motivation, and included questions such as “John Adams is for 2 as George Washington is for ...”, which are clearly not related to any type of innate intelligence, but instead to the knowledge of the particular history and/or culture of a certain “group”. Gould also explains how the IQ scores continue to be incorrectly interpreted as indicators of the innate intelligence of the members of a certain ‘race’ or ‘group’ of modern humans, when is actually well known that, for instance, persons of a same “group” that have different socioeconomic backgrounds have remarkably different IQ scores. Again, if certain small isolated groups of modern humans seem to be associated with peculiar anatomical and/or genetic synapomorphies, I see no reason to completely discard the (politically incorrect) hypothesis that these groups may also have peculiar psychological capacities. However, I simply do not know a single scientific study that has provided convincing evidence to show that there are consistent and substantial differences between the innate psychological capacities of different groups of modern humans. By stressing the influences that human biases have played in natural sciences, it is expected that the present paper might precisely help to promote, and to pave the way for, future, and hopefully less biased, works on these and other delicate topics.

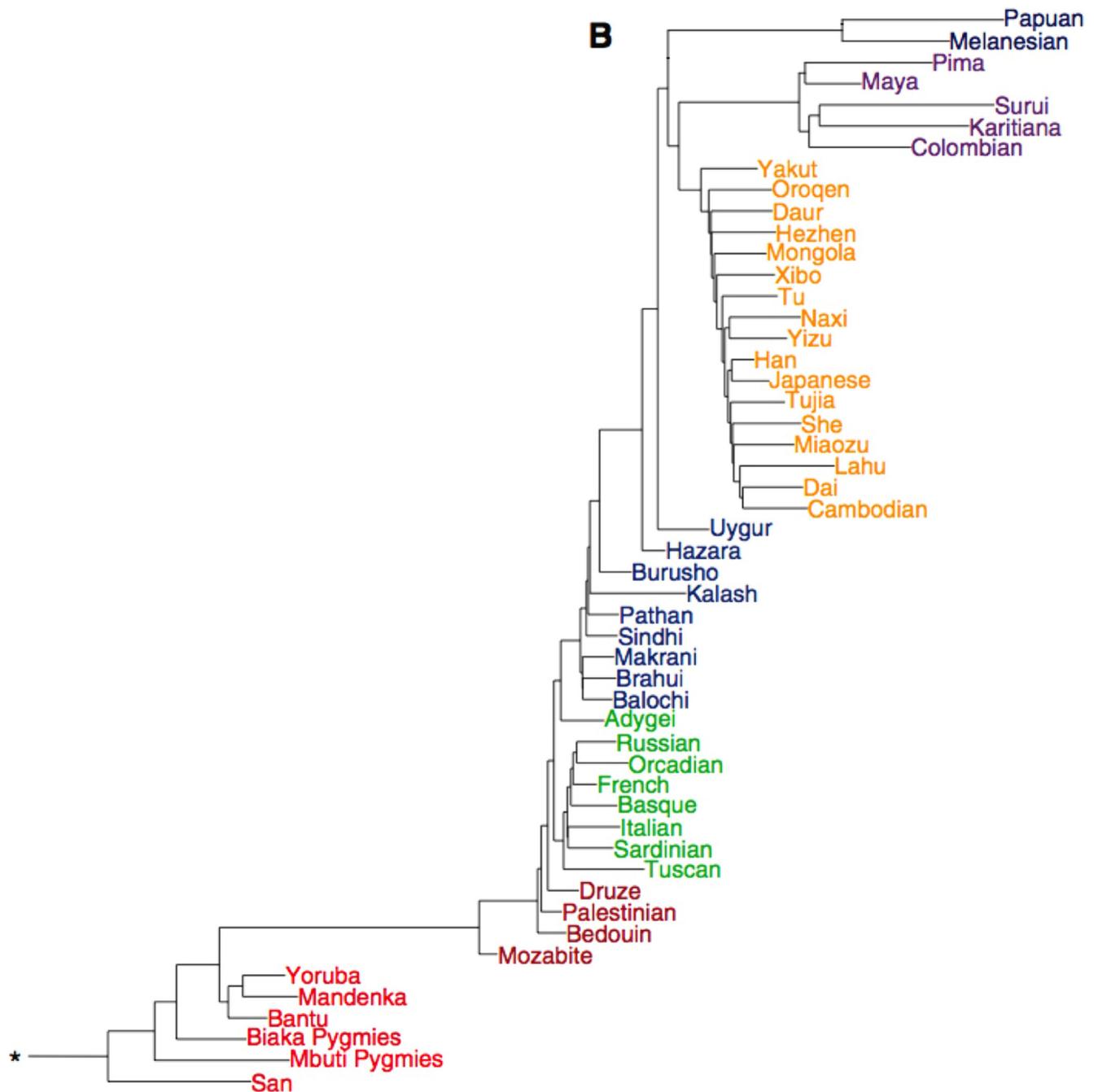


Fig. (8). Maximum likelihood tree of 51 populations of modern humans. Branches are colored according to continents/regions (red = Africa; brown = Middle East; green = Europe; light blue = S. C. Asia; orange = E. Asia; violet = America; dark blue = Oceania); * indicates the root of the tree (modified from Li *et al.* 2008 [89]).

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