

Expert Commentary

NEW DIRECTIONS IN PALAEOANTHROPOLOGY

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Anthropology, a specific subfield of ethology, because it deals specifically with our own species, tends to be characterized by a more emotional approach than is common in other ethological fields. This may explain why standard methods that are commonly used in ethology, such as comparative biology, are remarkably rare in anthropology and especially palaeoanthropology. Anthropologists tend to view humans as unique, and therefore fail to apply comparative methods on humans and their fossil and living relatives, as would be done as a matter of practice in a number of other fields. As long as this anthropocentric attitude continues, it will remain impossible to reconstruct human evolution in an objective manner.

It is now more than half a century ago that Max Westenhöfer (1942), and later Sir Alister Hardy (1960), proposed on the basis of comparisons with other animals that humans were more aquatic than had generally been accepted. They had noticed (independently) that humans differ from other primates by possessing a much thicker layer of fat directly under the skin, and by lacking fur on most parts of their body. To them, this was a striking similarity to other furless mammals with high amounts of subcutaneous fat. All mammals that are both fat and naked are either fully aquatic or tropical semi-aquatic (the reverse does not necessarily hold), for instance, the Sirenia, Cetancodonta (whales, dolphins and hippopotami) and some Suidae and Pinnipedia. Since this is the case, why should humans be an exception? When Hardy (1960) straightforwardly suggested that this might point to a semi-aquatic past for our ancestors in tropical regions, he was either ignored or ridiculed by nearly all anthropologists. It was then believed (for reasons we describe in Chapter 6, “The original econiche of the genus *Homo*: open plain or waterside?”) that humans had evolved directly from forest dwellers (quadrupedal non-human primates) to become open plain dwellers (bipedal humans). The fact that other primates that went from forests to open plains, such as savannah baboons, had not lost their fur, had not developed large subcutaneous fat tissues, and had in

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fact become more quadrupedal rather than bipedal, was and still is apparently of no concern for those favouring the ‘quadrupedal = forest, bipedal = open plain’ model.

Whenever fossils of possible human relatives are found, the palaeofauna and -flora tend to be viewed in light of the open plain interpretations, and most interest therefore focuses on whether the landscape was open or forested. The fact that aquatic taxa are prevalent at many sites (see Chapter 6) seems inconsequential, and these are usually only referred to in scientific papers if they add something to the dating, stratigraphy or taphonomy. This unbalanced focus can be explained by the implicit or explicit conviction that the open plain or savannah view of human evolution is beyond doubt, an attitude which we think is largely due to a combination of educational biases and anthropocentrism. It is difficult to understand, for example, that anthropologists rarely consider the obvious fact that what is true for other animals (for instance, “all fat and naked mammals spend a lot of time in the water”) might also be true for human ancestors.

It is clear to us that a reconsideration of the usual anthropological models for human evolution without anthropocentric biases will open new insights into how our ancestors evolved. In Chapter 6, we first reconsider the ‘open plain’ idea by examining one of its most recent incarnations, the ‘endurance running’ model, and show by using objective criteria such as comparative data that there is no support for a savannah or endurance running based interpretation of our past evolution. We then reconsider the sites of fossil *Homo* in an unbiased way, and conclude that most if not all sites were clearly at the waterside.

In our opinion, the reconstruction of the evolutionary history of a living species should be based in the first place on behavioural, anatomical and physiological comparisons of the species to its extant relatives and to other animal species, rather than on the interpretation of fossil finds. This is primarily because making sense of the (usually patchy, incomplete and scanty) fossil record strongly relies on interpretations, and it is never certain whether the supposed ancestor was an evolutionary dead end or really was an ancestor of a living species: we know we had ancestors, but we do not know whether fossils have descendants. At the same time we think that anthropologists need to acknowledge how unlikely it is that human subcutaneous fat, furlessness, breath-hold capacities and poor olfaction could have evolved because human ancestors lived in dry, open habitats.

We suggest two methods should be employed more frequently for future research into reconstructions of how human ancestors may have lived:

- (1) In describing the accompanying palaeoflora and -fauna of a hominid site, attention is often given to the larger mammals and to the animals that can be thought to elucidate the supposedly savannah lifestyle of our ancestors. We suggest that the invertebrate, fish, avian, reptilian and smaller mammal fauna should also be studied in detail, and that anthropologists should keep an open mind to the possibility that not only the savannah itself, but the waterside, whether in the savannah or not, might be an essential element in human and hominid evolution. It is true that fossilisation in terrestrial settings mostly occurs in sedimentation in quiet waters and that this alone by no means suggests that the animals fossilised lived in these waters, but it is also the case that this does not exclude the possibility that they might have spent more or less time in these waters. Preliminary (Verhaegen and Puech 2000) and more thorough studies (Munro 2004, and Chapter 6 in this book) of the fauna associated

with hominid palaeoenvironments reveal that the aquatic components are often both significant and considerable.

- (2) Anthropologists who construct models of the original human ecomiche tend to focus on the fossil evidence. But while the fossil record can provide crucial insights, its importance can also be overstated. Fossils are incomplete, typically they are fragmented pieces of bone without soft parts, and their exact phylogenetic relationship to living species is often uncertain. Frequently, species, age and sex are unknown, and the geological age and palaeoenvironment uncertain. The comparative method, which compares the behaviour, anatomy, physiology and DNA of *living* animals, is more secure, systematic and reliable than the fossil evidence. Therefore, we think thorough inventories and comparisons of the most diverse features of the most diverse animals are needed in order to discover correlations between these features.

Human features such as language and bipedal locomotion are often seen as unique, and consequently anthropologists tend to rely on functional interpretations instead of comparative arguments. But functional interpretations often mean subjective 'explanations': since we 'know' our ancestors lived on the savannah, it is easy to conclude that in humans, unlike savannah mammals, the function of subcutaneous fat, for example, was for thermal insulation in the cool savannah night, or as an energy depot to combat extended dry seasons. And because it is 'known' human ancestors were living on the savannah, there is no need to consider that subcutaneous fat, seen in all fully aquatic and many part-time water dwelling mammals but never in typical savannah mammals, could have been an adaptation to part-time water dwelling (be it for energy storage, thermo-insulation, streamlining, buoyancy or some other reason).

That some human features can appear to be unique, such as our language and locomotion, does not mean that comparisons with other animals can not be made. What is required is to separate these features into as many individual components as possible (ideally these components should be independent from each other). The finer the distinctions, the more detailed reconstructions can be obtained. Since biological features are generally inherited independently of each other (Mendel's Laws), due to the crossing-over and re-assortment of chromosomes during meiosis, there is no reason not to use an analytic approach.

We provide a possible illustration as a starting-point for future research. It is often believed that human locomotion was an adaptation to the open plains, but when we separate our locomotion into its individual elements, this belief appears to be a just-so interpretation:

- a) *two-leggedness* is seen in birds (including ostriches, flamingoes and penguins), many dinosaurs, and diverse mammals (including hopping mice and kangaroos on the savannah, indris and gibbons in the branches, and lowland gorillas and proboscis monkeys while wading, though not in most wading mammals);
- b) *full plantigrady* (with the heels usually touching the ground or branch) is, for instance, seen in water opossums and sealions, whereas cursorial animals run on their toes or hooves (digiti- or unguligrady);
- c) *very long legs* relative to trunk length are typical of frogs, kangaroos, indris, tarsiers, giraffes, ostriches and flamingoes, to name a few;

- d) *straight legs* (as opposed to bent-knees-bent-hips in rest) are seen from wading-birds to giraffes, especially in large and heavily-built species;
- e) *a striding gait* (with alternating limbs, as opposed to hopping) is seen in many walking, running and wading birds, and more frequently in larger-sized than in smaller birds;
- f) *truncal erectness* is seen in some arboreal species (especially tarsiers and gibbons), meerkats on the look-out, penguins on land, etc.;
- g) *a latero-laterally broad trunk* is typically seen in beavers and platypuses, and to a lesser degree in brachiating primates (apes and atelids);
- h) *an alined body* (with head, trunk and legs in one line) is typical of swimming animals; and so on.

While we realise that these resemblances are often subjective and that the comparisons are preliminary, they nevertheless indicate that humans resemble cursorials (c) less than they resemble arboreals (c, f), waders (c, d, e) and swimmers (b, g, h). This would be consistent with an idea that human ancestors were once tree dwellers who learnt to wade, swim and run.

This exercise can be repeated with all other features in which humans differ from our closest relatives the chimpanzees: furlessness, subcutaneous fat, olfactory reduction, external nose, parabolic tooth row, very large brain, and even human speech can be analysed into smaller elements (Verhaegen and Munro 2004). By combining all these results, we can develop a data set that can be used to evaluate various models of human evolution, including the ‘waterside’ and ‘open plain’ models.

In our opinion there has been too much focus on the role of open plains in human evolution, and not enough consideration given to the role of waterside habitats. Decisions of which data to collect and which models to test are compromised because of a widespread acceptance within the anthropological community that human evolution took place on the savannah. To redress this imbalance and to ensure a more objective approach, we believe that the study of how human ancestors lived will be greatly improved by (1) a non-savannah focused reconsideration of the fossil palaeoenvironment, and even more so by (2) a detailed and analytical comparison of typical human features with the widest possible range of animals.

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