UISPP:

Why did early hominins migrate?

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We now take for granted that modern humans migrate in search of a better life. They do so in view of the information they have regarding other lands and political systems. Anticipation and motivation are fed by communication. We also know that many animal species, notably birds and fishes, seasonally migrate over very long distances. Primates, however, are limited in their capacity to engage in long migrations toward unknown lands. The issue of finding out why and how very early humans started their journey out of the African forests to eventually populate most of the planet is a tantalizing question. Did they spread over successive short distances a generation at a time, or did they engage in deliberate long migrations once they had become bipedal? Did they move opportunistically, or were they forcefully displaced by external forces either natural or social. In any case, some conditions are necessary for such adaptive migrations to occur: perceptual, cognitive, and social adaptations are indeed prerequisites. First, perception must have evolved to process distal space since surviving in a savannah environment requires the processing of information that comes from a greater distance than what is optimal in an arboreal niche; secondly, migrating humans needed advanced cognitive capacities to project actions beyond the immediate future and plan longer-term, adequate strategies; finally, successful migrations must be sustained by a sufficient level of social organization. This paper will examine one of the perceptual conditions for dispersal beyond proximal boundaries and discuss the evolution of the sense of perspective and its limitations as a possibly determining factor in priming long distance migrations.

1. Introduction

Evolution is a short-sighted tinkerer, not an optimal design engineer. As the environment which selects adaptive variations changes, some phenotypic traits can

become handicaps or can be recycled into new fitness enhancing functions. Like all scientific discovery, evolution through natural selection is counter-intuitive but logically compelling. The purpose of this paper is to offer a hypothesis concerning a behavior plausibly caused by an evolutionary fluke. The argument presupposes bipedalism and can be construed as a priming move toward the first migrations out of the common ancestors' niches of hominids some six million years ago.

2. From arboreal niches to ground habitats

The transition of hominids from arboreal to bipedal life is a hotly debated issue which cannot be fully addressed here. Let it suffice to say that the search for a single cause is probably misguided and the hypotheses which contend that bipedalism was a sudden change possibly brought about by a mutation or other factors are not compelling (Stanford 2003). However, it is relevant to the argument made in this paper to note that some form of bipedalism on robust branches is a part of the adaptive repertory of locomotion of a tree-dwelling primate. Reaching up for food, taking defensive or aggressive postures, scanning the immediate environment to identify resources or dangers, may require upright position and progression. Occasional bipedalism can be observed today among chimpanzees both in trees and on the ground (Stanford 2003: 114-121). Assuming that this intermittent motor competence was a part of the behavioral repertory of the common ancestor of apes and humans, a progressive change of environment from the forest to the savannah would have necessarily selected the best upright walkers without any drastic modifications of the body plan. The body size proportions and anatomic structures of Pan Paniscus (bonobo) and Australopithecus are very similar (Falk 2000: 351). One of the most intriguing but plausible hypotheses was proposed by Bramble and Lieberman (2004) who made the case that running (to flee or catch small prey) must have preceded walking. Craig Stanford (2003) has rightly pointed out that looking for a single cause is misguided. There must be continuity and cumulative small changes in the mode of locomotion during the transition to land dwelling progressively leading to the selection of exclusive bipedalism. Note that forms of partial tree-dwelling are still observed among humans, thus showing that this adaptation remains

functional. Given the body plan of primates, moving around on four legs is not optimal as it is a disadvantage in confrontation with prey and predators which have evolved very efficient ways of stalking, running, pouncing, and fleeing. But primate bipedalism changed sufficiently the game for being selected in the race for survival. However, as we will see below, evolution is conservative. Various adaptations can happen to be clobbered together without being necessarily consistent. Some quasi-perfect fits in a given environment can become relative liabilities in another.

3. Vision and action

Having evolved for millions of years in an arboreal environment, the body plan and the visual system of hominids had been fine-tuned with respect to the constraints of this kind of three-dimensional niche (Kendal et al. 2011). The processing of spatial and chromatic information relevant to their survival determined the range of perceptions and actions which, incidentally, remain adaptive for humans today mainly in their built environment which somewhat mimics general tree-like niches through the accumulation of modules of convenient dimensions. Early hominins who inherited these competencies could survive and reproduce once they became mostly bipedal likely after a lengthy transition. Naturally, the way bipedal hominins perceived their life world was necessarily biased by the neuro-cognitive legacy of their tree-dwelling ancestors but it just happened that this toolkit was good enough for them to prosper on the ground as long as this new environment was not too drastically different from the original one and consisted of patches of resourceful territories which were located within walking distance. It suffices to compare *Homo* with the herbivorous and carnivorous species which have evolved as land mammals to realize the gap which exists between their respective adaptive behavioral repertoires. In relatively recent times, the gap has been mitigated by the domestication and harnessing of species such as Equidae and Camelidae which provided humans with the extra competencies they needed to be better adapted to terrestrial life which implies the need for covering and exploiting much larger areas than arboreal habitats when resources become scattered beyond easy reach. But the archaeological

record indicates that migration over long distances preceded domestication by several millions years

Action and visual perception form a complementary functional system which is sometimes referred to as the eye-hand coordination system. But this type of coordination between vision and action could as well be characterized as the eye-foot coordination system once we consider the vital demands of a bipedal organism. The eye-hand neuro-motor system is perfectly adaptive with respect to proximal targets of the kinds which are found in tree environments. Eye-foot motor coordination requires the efficient processing of information regarding remote direction. Arboreal adaptations are reasonably functional for negotiating extended environments on the ground as humans usually can accurately throw projectiles within a reachable range and evaluate the distance they have to walk or run to cover the space which separates them from a goal as long as this target is not beyond the threshold of their sense of perspective. Indeed, as pedestrians, we know that we are very poor at estimating longer distances by using solely visual cues in an unfamiliar environment. There is a threshold beyond which we constantly make errors of judgment if we do not have supplementary information such as maps or indications of actual distances. If they rely on their visual system alone, modern humans cannot adaptively negotiate distal space unless their action is mediated by calculations. “Adaptive” must be understood here as enabling an organism to reach targets which are within its energetic potential. For example fleeing toward a tree or a shelter in the face of danger is adaptive only as long as one does not collapse of exhaustion before attaining that life-saving spot because the distance has been underestimated.

When considering, as a working hypothesis, that hominins, perhaps even hominids were at some point confronting an open space of which they did not have previous experience, it is plausible that the horizon seemed to them much closer than it actually was and that the objects distributed in this space appeared to be closer to each other and within easy reach whereas they were actually many kilometers apart and far away in spite of appearing to be more or less aligned on the same horizon line. Let us imagine a group of hunters who start walking in early morning toward a large tree with the belief that they will reach it at midday. As the sun is high in the sky, they realize that the tree is still far

away. If they survive their mistake and can return safely to their base, they will have constructed a first approximate map, a knowledge which will likely be shared among the group. There is no suggestion here that such a single event would be very significant. Instead, we must consider that the repetition of this experience by many independent groups over a very long period of time could have generated a collective reassessment of the structure of distal space in which objects seem to recede as you believe that you are approaching them. This is the crucial moment when culture may compensate for the shortcoming of the perceptual system which these hominids, and ourselves, inherited from their tree-dwelling ancestors. But local spatial knowledge cannot be assumed to have sunk immediately into the general cognitive competence of the *Homo* species. After all, we still occasionally fall victim to this visual illusion when we explore a new city and progress endlessly toward a beacon which appears to be within walking distance.

4. A matter of perspective .

Because of its centrality in human life, vision has been extensively researched by psychologists. The way in which distal space is distorted when the vantage point varies requires some pragmatic adaptation if one is to successfully negotiate the distances of areas much larger than the average niches and territories in which the ancestor of the *Homo* species has evolved 3-D perception. Humans are at a marked disadvantage compared to Equidae for instance because the lateral position and mobility of the latter's eyes allows them to monitor almost the totality of their surrounding space. The only definite adaptation of human vision is the capacity to evaluate the distance of objects from a vantage point through the sense of perspective but only within some limits beyond which accurate evaluation becomes impossible because the continuous surface which connects the base of objects appears to decrease drastically after the threshold is crossed. In all likelihood, this average distance is sufficient for controlling the safe monitoring of prey and predators in relatively open space at distances which are relevant to survival but not beyond.

This set of visual adaptations and their evolutionary history must be kept in mind when the question of human mobility is raised. A caricatured expression of the

hypothesis propounded in his paper would be to state that hominins first migrated long distances because they were lured by land targets which appeared within walking distance and realized their mistake too late to retrace their path. However, if we accept the liability represented by a visual system which was irreversibly selected by an environment characterized by its limited horizon, the challenge of a theoretically infinite horizon cannot be met by the perceptual resources of a brain molded by the ancestral niche of the *Homo* species.

The cognitive mastery of terrestrial global space is a very recent cultural construction. The only natural appreciation of large expanses of land could be gained by *Homo erectus* from an elevated vantage point such as a tree at the edge of the forest or the top of a hill, although we cannot be sure how this space was perceived. It is probable that very early knowledge of the extended environment was conveyed through narratives recounting explorations and supported by graphic renderings of relations such as sand drawings and rock art. These representations were likely anchored on the apparent movement of the sun if they were to have any pragmatic value.

But at the dawn of *Homo*'s migration out of the forests we need to imagine the circumstances which primed the first long distance trekking in the absence of any realistic conception of the spatial affordance provided by the savannah horizon. This is why the only plausible explanation is the evolutionary fluke which deprives the primate brain from correctly evaluating distal space beyond the horizon of its ancestral environment to which it had irreversibly adapted.

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