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Peer Review

Review of: "Derivation of Human Constructs of Reality"

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Review of „Derivation of Human Constructs of Reality" by Robert Bednarik

I have recently co-authored papers with Robert Bednarik[1],[2] so I am not completely objective in my review. I will not re-iterate points that Robert and I agree on. I will try to indicate where we may differ with the intention to improve his arguments rather than to provide straight criticisms. I follow his practice of self-citation. After all, we have published numerous papers to be read in support of our arguments.

How humans achieved the "facility to create models of reality" is an important question. The Author recognises that human models of reality are just that – models corresponding to actual reality only to a degree. In this, the models are not different from those constructed in the brains of other animals. Some of the animal models are more efficient for specific purposes than human models. For instance, homing pigeons can return home from far away using mental maps constructed from various sensory inputs[3]. They cannot communicate those maps to us in verbal or graphic form, so we seem to overlook them, but they come home from a distance, and we do not [without a GPS].

Since we are just mammals, Plato's allegory of the shadows on the cave wall is apt for the description of our mental models of reality. The human brain did not evolve to think logically; it evolved to keep us alive in challenging environments where split-second decisions regarding being hunted or hunting had to be made[4]. Thus, the brains of human individuals produce, as Robert says, various images of reality that have varied degrees of correspondence to what actually exists.

Curiously, Plato derived a wrong conclusion from his images-on-the-cave-wall allegory. He concluded that the real world contains invariable ideal templates of objects. These, being invariable, keep the

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world stable, rendering the passage of time and interactions among objects worthless of consideration. His essentialism still plagues the study of human evolution, which is perceived as the creation and extinction of various "species" instead of the ongoing process of modification of various characteristics and abilities.

Humans, in contrast to other animals who rely entirely on their sensory inputs to construct their models of reality, developed extrasensory ways of testing reality. These, in the present-day world, we call "experimental methods" that use special devices and procedures to interpret various phenomena. The Author gives an example of monochrome vision limiting the ability to understand the role of colours in the world's perception. True enough, were we colour-blind, we could not easily interpret why some animals react differently to images of the same grey shade. However, when we developed ways of measuring wavelengths of light by devices external to our bodies, we could tell that the light of a particular, rather low, wavelength (=red) causes a violent reaction in a bull, quite different from a similar shade but the shorter wavelength of green light that has a calming effect on some humans. My colour-blind friends understand this well. Archaeology provides finds that can help us understand how the use of extrasomatic implements enriched our ways of constructing models of reality.

I agree with Robert that humans, since evolving complex social systems of alloparenting and collaboration in basic ecological tasks of obtaining energy from the environment and protecting the lives of group members, produced for themselves a situation that can be described as self-domestication. I do, however, disagree that self-domestication produced depigmentation or the reduction of prognathism simply because most humans living on the Earth now are dark-skinned and many are prognathic -- have large jaws. Some of them are my Aboriginal Australian friends, among the most intelligent people I know. I think Robert is focusing too much on the transition from Neandertals to anatomically modern Europeans. Not his own fault. He may be inadvertently influenced by the debates of the Neandertal/modern transition in Western Eurasia that are abundant in the literature, while transitions to modern Southeast Asians or Khoi-San Africans are less debated. A literature bias.

A big problem regarding the self-domestication hypothesis is the selective breeding. Palaeolithic humans lived in small groups scattered over large territories. In this situation, finding any mating partner was foremost, and selective rejection of mating partners could jeopardise the multi-generation existence of local groups. The demographic dynamics of past populations were that of high mortality (over 50% of individuals born did not survive to mate and produce offspring) and high fertility (6-7 children per woman surviving to menopause)[5]. In this situation, every mating counted. There was

little room for shunning a reproductive mate. Moreover, the free selection of mates for the next copulation based on their physical characteristics was limited by the long-standing practice of [at least transitional] monogamy. Like in many foraging societies today[6], adolescent girls, around the age of their first menstruation, were engaging in reproductive activities. The physical appearance of an adolescent girl, as Robert correctly says, is that of a slim, neotenous person. However, when she grows up, a few years and a couple of pregnancies later, she may be a large, voluptuous woman in the shape of Willendorf's Venus. However, she will have no problem conceiving later half a dozen pregnancies. The only way for her to conceive a pregnancy, at least in Palaeolithic times, was to copulate with a male who was attracted to her sufficiently enough to ejaculate. Older, married women had fertile lives with their partners. Older widows re-married and produced more children. This is proven by past populations having average Total Fertility Rates of 6-7 children[5]. Birth intervals in non-Malthusian (non-contracepting) populations are about 2.5-3.0 years, so a woman conceiving her first child at age 15 years will keep producing children until she is 7x3+16 = 37 years old, or older. Little opportunity for selective breeding, but selective breeding can't be completely denied. However, selective breeding, denying the use of reproductive ability of some individuals, is a very dangerous practice because it lowers the reproductive success of a population. The past human populations, due to high mortality, could barely maintain their natural increase above zero. In this situation, removing some fecund individuals from participation in reproduction could lead to the disappearance of a population through a negative natural increase.

I am wondering why the blossoming of palaeoart, so abundant in Europe, was less obvious in other parts of the world where perfectly modern humans should emerge at about the same time. Is there a dearth of archaeological exploration? Or, perhaps, the forms of paleoart there were located at sites less favourable for preservation? Palaeolithic human populations were small, and their density was low. In such situations, contacts among local populations spread over large distances, ensuring gene flow over hundreds of kilometres in one generation[7] and thousands of kilometres in a few thousand years[4],[8]. Thus, genes promoted by the changed breeding situation in Europe should have spread to the rest of the Old World quickly.

I am afraid that by arguing that Europeans were the earliest to achieve gracility, reduced prognathism, smaller teeth, lighter skin, and modern human cognitive abilities, the Author made them appear as superior White Men! I know that Robert would not have ever even considered producing such a suggestion, being a broad-minded and considerate anthropologist of the highest standard. It happened

inadvertently because of the imbalance in archaeological and bioarchaeological evidence that is denser for Western Afro-Eurasia. However, one should be aware of misinterpretations that may be derived by biased extremists.

By the way, skin "depigmentation" is a simple result of the natural selection for levels of strong ultraviolet radiation (UVR) in the atmosphere that must be prevented to reduce the carcinogenic effects of UVR and the need for appropriate UVR exposure to produce sufficient levels of vitamin D in the body. The skin pigment – melanin – is produced depending on the balance between these two needs – protection against carcinogenic effects and the need for vitamin D[9]. Its production is genetically controlled by the effects of natural selection. People of Northern India and adjacent areas have anatomical structures of their faces indistinguishable from Europeans, while their skin is much darker. People of Northeast Asia have pale skin, while their facial features are clearly different from those of Europeans.

I agree that the paleoart included the work of children and adolescents. We have measured the hands of Khoi-descendant children and juveniles in the Western Cape Province of South Africa[10] to enable archaeologists to determine the age and body height of persons who left handprints in rock shelters in this part of Africa. Most handprints studied there turned out to be made by sub-adults[11]. Some of these handprints were made by local people in recent times, in the early stages of the colonisation of South Africa by Europeans. Thus, there is a continuity of the practice of hand printing by children and adolescents through geographic space (Europe - the southernmost part of Africa) and time (Palaeolithic - late Holocene).

Since human males and females have the same genes in the whole of their genomes, except for the small part of the Y chromosome in males, morphological changes of females and males as the result of self-domestication should have happened contemporaneously. I do not question the fact that female morphology changed earlier than male morphology; I just wonder why and how. The microevolution of the non-homologous [with the X chromosome] p-arm of chromosome Y must have occurred. We need to learn more about it.

The reduction in brain volume that accompanied the auto-domestication is a statistical phenomenon. I was among the first authors who documented it as long ago as 1988[12]. However, I do not think that this significant decrease in brain size by about one standard deviation (~150 ml, = 10% of the average) had any consequence on brain functions or mental abilities. Among present-day humans, the variation of brain size from less than 900 ml to 2000 ml does not correlate with mental aptitudes, even within

one homogenous population[13]. With the gracilisation of human bodies, the musculoskeletal apparatus became smaller. Fewer motor units [which each must be represented by a neuron in the cerebral cortex] in the musculature meant fewer neurons in the cerebral cortex in motor areas. This, however, should not have affected mental abilities.

The development and spread of the use of exograms certainly helped to expand human abilities to create more complex and closer to reality mental models, but in my opinion, it simply added to already existing and not diminished by brain size reduction, mental aptitudes. The expansion of human control over the environment happened faster than when the postulated loss of brain abilities had to be compensated by externalised supplements. It is important to acknowledge that all Afro-Eurasian theatres of human evolution provide evidence of the use of exograms. Our ancestors were probably more adept at the use of various materials for exograms than we imagine, so what we discover archaeologically is a minimum of the evidence, and it may be biased by the perishability of various exogram materials.

The use of multiple exograms, as we see them today – symbolic signs, hieroglyphics, alphabets, paintings, and sculptures – has been limited to small fractions of historical and even recent societies. Two hundred years ago, large portions of world societies, including industrialising societies, comprised analphabets, people who could not read or write. Even today, some members of the "Western" communities have difficulties writing a simple message or reading a news article. Multiple models of reality held by various people prove to be wrong, as we are constantly bombarded by the news of scams and lies pushed by leading politicians. Self-domesticated people now are much better in terms of reproductive success than they were in the Upper Palaeolithic, but still far from an idealised model or reality that no one can produce.

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Declarations

Potential competing interests: No potential competing interests to declare.