Of course, humans are not unique!

Commentary on **Chapman & Huffman** on *Human Difference*

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Abstract: This commentary focuses on the question of the uniqueness of humans in comparison to other species and on the false assumption that single arguments support logical conclusions. Comparative analysis of genetic data in humans and nonhuman primates regarding the dopaminergic system of the subcortical mesolimbic reward system highlights homologous traits shared and modified by the process of evolution. Such an analytical approach is more relevant than claims of uniqueness.

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Chapman & Huffman (2018) (C & H) write: “the desire to see humans as unique still remains. Is this a valid scientific question?” No, it is not. The authors are right to ask: “If hypotheses about human uniqueness repeatedly prove to be wrong for one trait after another, does this not imply that the hypothesis itself is wrong?” C & H cite the philosopher Karl Popper (1968) on the problem of formulating hypotheses, specifically, the problem of inductive reasoning. Induction is a specific form of reasoning in which the premises of an argument support a conclusion, but do not ensure it. For example, there is no valid induction which can be drawn from the observation that "This swan is white" to the general statement "All swans are white.” This applies also to the question of whether humans are unique.

The comparison of different species has to take into account their different ecological adaptions to environments in relation to their behavior, physiology, and brain evolution. The common approach of finding simple analogies between species is scientifically irrelevant. The question is, do we find homologies? This can be illustrated with the example of the sensation of pleasure in animals. This emotion is subcortically located in the mesolimbic reward system. Comparative studies on vertebrate families such as fishes, amphibians, reptiles and mammals reveal homologous neuroanatomic structures (O’ Connell and Hofman 2011). The dopaminergic system is a key player in these brain areas (Beaulieu and Gainetdinov 2011). It mediates pleasure associated with predictive, motivational, or attentional sensations in relation to learning processes (Berridge and Klingelbach 2008). Analyses of divergence scores on neurochemical genes have revealed a conserved evolution across 450 million years in these brain regions (O’ Connell and Hofman 2012). The ability to perceive pleasure seems to be a basic evolutionary trait shared in vertebrates. Dopamine secretion is the cognitive basis underlying behaviors such as feeding, sexuality, or prosocial interactions. Obviously, vertebrates do not need neocortical

structures to perceive pleasure. In mammals, the dopaminergic system projects to the prefrontal cortex to mediate cognitive processes. At this point, the processing of projected information into the neocortex is critical, because consciousness, the quality of awareness, can differ substantially across species, at least in higher primates.

Based on the assumption that polygenetic risk scores for schizophrenia and bipolar disorder predict creativity in humans (Power et al. 2015), another study carried out comparative genetic analyses on the dopaminergic system in relation to creativity, addiction, and schizophrenia in humans and non-human primates (Wallner et al. 2017). Intronic SNP polymorphisms in *Homo sapiens, Pan troglodytes*, *Pan paniscus*, *Pongo abelii*, *Nomascus leuconenys*, *Maccaca fascicularis* and *Maccaca mulata* accelerated evolution for two categories of behavior: first, psychiatric disorders, schizophrenia, antisocial behavior, bipolar disorder, neuroticism, and second, substance abuse. Wallner et al. conclude, that the results, though interesting in according phylogenetic polymorphism to the order primates, are limiting. Genome-wide association studies have to be carried out to get in-depth and reliable information. A working hypothesis is that creativity seems to be a trait that is passed phylogenetically from non-human primates to humans.

This commentary has tried to illustrate that humans are not unique in the animal kingdom. Because of its evolutionary adaptation to ecological environments, uniqueness is expressed in each species. In general, it is nevertheless more important to consider homologous traits than to focus on uniqueness. Shared and modified genotypes help us better understand the expression of phenotypes. Evolutionary processes do not represent a hierarchical system of supremacy. The simple portray a process following a timeline for each species.

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