**Resumo do artigo de Huffman, M. A., Nahallage, C. A., & Leca, J. B. (2008).**

**“Cultured monkeys: social learning cast in stones.”**

In the study of animal behavior, the concept of culture was predicted to be present in all socially living animals since the half of the XXth century. From then on, evidence of behavioral culture regarding various mammalian, fish, and bird species has been increasing in the scientific literature. In order to compensate for the difficulty of studying culture as a whole, researchers have investigated different determinants such as innovation, transmission, acquisition, developmental constraints thereof, long-term maintenance, and intergroup variation. Nevertheless, the authors point out the lack of integrative view of these different determinants as well as the consideration of various influencing factors such as social, environmental, demographic and developmental constraints. Therefore, the authors propose to review the study of stone handling in both captive and free-ranging Japanese monkeys, which represents for them the only comprehensive study of a cultural behavior. Throughout the article, they also present study’s insights regarding the nature of social learning, its role in the spread of behavioral innovations, and the importance of culture in the process of behavioral evolution. They consider results from the two basic approaches to the study of social learning, one focusing on underlying mechanisms using controlled experimental design, and the other on the pathway of behavioral diffusion under natural conditions in a stable social group. Stone handling appeared in juvenile Japanese monkeys under 5 years old and was first transmitted horizontally among playmates during a few years before vertical mother-infant’s transmission. The comparative approach revealed that intergroup variability in stone handling may be best explained by demographic factors such as large groups with physically close individuals, opportunities for observational learning such as mother-infant interaction, and behavioral coordination at the group level such as the skill persistence between age classes. The authors also noted that neuromotor development constrained juveniles in acquiring rudimentary stone handling through mother-infant interactions that can increase in complexity with age. They argue that longitudinal and multi-perspective approaches are necessary to address the complexity of studying socially-biased learning and thus to get an understanding of behavioral transmission and innovation.

**Questões sobre o artigo de Laland, K. N., & O’brien, M. J. (2011).**

**“Cultural niche construction: An introduction.”**

From the slight introduction to Niche Construction Theory (NCT) in previous articles, I thought that the concept would reveal an interesting turnpoint in the way we perceive animal interactions in general. After reading the presentation from Laland and O’Brien, I can say it is indeed enriching the view. As Bickerton, for which the NCT appeared at the right time for formulating his theory on language evolution, I would say that this integrative perspective may bring a new lightning to an internal and current questioning.

As the Intergovernmental Panel on Climate Change (IPCC) keeps reminding us that we have less and less time left (3 years from now?) to mitigate the adverse effects of rapid climate change on ecological systems, I, from my part, keep wondering about how human evolution could have followed such a seemingly lost path? The hazardous and external selective pressures alone could not be satisfactory explanations. Indeed, from our ape common ancestor, it appears unlikely to think that the evolutionary way to current extreme resources consumption has been shaped by natural selection. Conversely, it seems rather probable that natural, so to say genetic, selection alone would have shaped human evolution in a much more resource-dependent direction, closer to direct water and food sites than it is today. For instance, my understanding of natural selection constrains me to think that the increased risk of pandemics would regularly select out large groups and render impossible the size of current societies. Besides, natural selection acts at the relatively slow rate of generations, taking between 15 to 40 years to transfer novel acquisitions to offsprings, and would be undoubtedly late in shaping social adaptations or response to resource crisis. From an inspiration-limited imagination, I don’t see how the human species could have evolved differently than other great apes, in size-limited groups living at proximity to resources, with just genetic selective pressures. It appears to be what happens in the human population living in extreme environments such as inuits or arid/desert communities, and where natural selection may exert a particularly strong pressure.

Then, of course, cultural selection is another parameter to consider, especially to account for faster evolution than generations of humans. Yet, even cultural evolution would not make enough sense to explain the straight-to-the-wall direction human societies are heading for. Our cultural legacy is indeed faster than genetic heritage but is also more flexible. With only cultural pressures acting in between genetic selection, it would rather allow for a more sustainable way of life, relatively rapidly selecting out deleterious traditions. As an example, trepanning and bloodletting have virtually not prospered to this day but lip-kissing has. The former can present a health and survival risk through blood loss and contamination whereas the latter can improve immune systems through salivary’s antibodies exchanges. Similarly, human communities have buried or burned corpses early on, avoiding putrefaction-related disease, and hunter communities are heard to regulate their pressures on prey in order to avoid driving extinct prey populations and thus starving. Surely, cultural evolution would have shaped a different and more prosperous lifestyle than what industrialized societies have nowadays.

My internal questioning had reached this conclusion for a while and was lacking the perspective from NCT to move forward.

Indeed, as the authors stressed in their article, niche construction has a direct and indirect feedback effect on both constructors and surrounding living beings, and need to be considered when addressing the causes of evolutionary pathways. Humans do not appear particularly adapted to get food, retain body water, live in any particular habitat, or to generally secure any kind of resource in a particularly effective way that would explain our current ecological success. Yet the result is here and clear, and only ants compete in the same success category. However ants are able to individually transport huge amounts of resources relative to their body size and they have quite effective cuticular protection against desiccation for instance. So what about humans? Body temperature regulation, swimming, climbing, running, vocalizing, localizing, smelling, touching, or even breathing is not our speciality. But interacting with our environment might be. Not being particularly adapted to any environment but with the ability to adapt our environment appears to me as a very plausible hypothesis to our ecological success. Could human niche construction’s dynamics interact and modulate cultural and genetic evolution, leading to the current state of evolution?

According to my understanding of the NCT, it seems that individuals who interact the most with their environment and have the greatest influence on their niche would drive the evolutive pressures. Thus, could it be that even if niche creation is stochasticly good and bad, the individuals interacting the most with the environment would have the most opportunities to either create favorable environments for themselves or to cope more rapidly with emerging bad environments, and consequently would be the survivors and the best reproductors among others? Individuals with low environment interactions and coping abilities would be driven extinct by highly-interacting individuals. Following this theory, human evolution would have been largely shaped by the ability to rapidly or strongly modify our environment, independently of the positive or negative valence of the change, rather than shaped by any evolutionary prosperous ability? The human species appears to be one of the living beings having the most impacted and altered environment, in other words, we live in what seems like a highly constructed niche. This view may be anthropocentric as to what markers are used to evaluate the level of niche construction. However, unnecessarily comparing human niche construction with ants or killer starfish ones, our impact on biodiversity seems extreme. In relation to selective pressures acting on our ability to interact with our environment, could it also explain our relatively high level of sociability, considering conspecifics as an element of the environment?

I might get carried away in evolutionary explanations but, as the authors wrote in their articles, NCT allows another understanding of evolutionary dynamics and enables us to generate more sense in our theoretical framework. Since then, evolutionary perspectives restricted to genetic and cultural pressures did not carry enough explanatory power to me and often left only a partially satisfied scientific reasoning.

Back on our human perspective issue, it makes me wonder if this interacting ability has evolved into an extreme phenotype? Would this selective evolutionary pathway drive us to extinction? Rapid climate change will impact the whole planet and harshen the living conditions for many living beings, including humans. Some ecological systems will disappear while some others will emerge and Nature as a whole interacting entity between living organisms will persist. But will humans be part of this future? Are we heading to an evolutionary dead-end?

Early humans would have had a tendency to interact with their environment. They would alter their niche, which would alter their living conditions. This would impact on both their behaviors and development and thus alter their cultural evolution. It would then also impact their survival and reproductive success, and thus alter their genetic evolution. If the living conditions improve such as creating controlled fires, it’s all for the better. If the living conditions deteriorate such as wildfires, then instead of not using fire anymore, selective pressure would still favor individuals that modify their environment and create fire in adequate ways. Are evolutive pressures a constantly forward pushing force? As the example in the authors article, when diseases spread because of agricultural practices, instead of stopping the practice, they increased it in order to produce enough to fight the affliction. This forward pushing force leads to evolutive races where mosquitoes become more resistant for instance, and humans have to increase their physical or environmental fight. This forward pushing force is the motor of innovation, admittedly, but couldn’t it be reversed sometimes? Probably not. However, hope is not dead. Even if one only goes forward, it is still possible to turn around and go straight back, still heading forward.

Our current society seems to emerge from a countless stacking of palliative solutions to ever-rising issues. To illustrate this view,it could be summed up that we used petrol to create more energy and so we used more energy in our daily lives but we ran out of easily accessible petrol, so we used energy to create ways to access difficult petrol to keep on producing more energy. As a result, we used even more energy in our daily lives and we ran out of petrol even faster, so we used energy to create other ways to create energy, in an endless negative retroactive loop. We live on this unstable equilibrium and our culture evolves accordingly, maintaining the stack of palliative solutions. If the evolutionary pressures have favored straight forward evolution until now, wouldn’t curved forward be the new fittest direction from now on? Feedback effects from the environment can have positive retroaction. Thus, instead of aiming at going backward or stopping on tracks, could a solution be to learn how to selectively interact in a positive way with our environment? This actually means that we should drive our cultural evolution towards new positive practices, which would generate a legacy allowing new generations to construct niches in a beneficial way for ecological systems and therefore for the human species, modifying selective pressure of cultural and genetic evolution.

But how can we impact and change our cultural evolutive pressure in order to be ecologically pertinent? Culture is supposedly relative to interactions, observation and artifacts. Modifying our interactions and producing artifacts is relative to niche construction. To curve the evolution of our species in a more sustainable perspective, humans could start by displaying evolutionary pertinent behaviors such as living in smaller communities and gaining relative resource independence. Could this change of niche generate a sub-society where cultural and genetic pressures are expectantly modified ? Culture, survival and reproductive success would be based on ecological knowledge and prosperous interactions, securing access to resources for the community.