

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

How does the Chimpanzee Mind Represent its Cultures?

Permalink

<https://escholarship.org/uc/item/8jg1j2q8>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 43(43)

ISSN

1069-7977

Author

Gruber, Thibaud

Publication Date

2021

Peer reviewed

How does the Chimpanzee Mind Represent its Cultures?

Thibaud Gruber (thibaud.gruber@unige.ch)

Faculty of Psychology and Educational Sciences

Swiss Center for Affective Sciences, University of Geneva, Chemin des Mines, 9
Geneva, 1202 Switzerland

Keywords: animal cultures; chimpanzees; tool use; functional representation; metarepresentation; affective approach; behavioural ecology

A Cognitive Approach to Wild Minds

Tools are peculiar parts of our environment and tool manufacture remains one of the most prodigious achievements of humankind over the last million years. Chimpanzees, along with other non-primate species, also use and sometimes manufacture tools. In my research, I have investigated the cognitive, ecological, social and emotional factors influencing tool use in wild and captive apes, with a focus on Ugandan chimpanzees. In parallel, I have researched cognitive aspects of the evolution of emotional and intentional communication by studying primate, particularly great ape, vocalizations. Finally, in more recent years, I have investigated the same topics in children, to investigate the possible homologies with humans and our shared ancestry and specificities. My goal is to understand the evolutionary pressures that launched humans on the particular evolutionary pathway that have allowed them to become the ultimate culture-bearers. I am also interested in how other species, in turn, see the world. The research program I develop integrates these interests in a comparative, ecological, cognitive and socio-emotional approach to cultural knowledge in great apes and humans.

A Cognitive Approach to Chimpanzee Tool Use

To do so, I investigate the behavior of wild chimpanzees using a mix of observational and experimental techniques. Crucially, I investigated experimentally whether the Sonso chimpanzees of Budongo Forest, Uganda, were really ‘tool-less’ chimpanzees (Reynolds, 2005), and if so, why. I developed a field experiment exposing chimpanzees to a honey-trap apparatus to investigate how they would extract inaccessible honey from a hole (Figure 1). This initial study, (Gruber, Muller, Strimling, Wrangham, & Zuberbühler, 2009), showed that members of two different chimpanzee communities, Sonso and Kanyawara in Kibale Forest, used different materials to manufacture tools, in line with their cultural knowledge. In particular, no Sonso chimpanzee used a stick to access honey but some manufactured sponges from leaves. The Kanyawara chimpanzees in contrast, used sticks, the usually preferred tools for chimpanzees to extract honey (Figure 1). Interestingly, further exposure (Gruber, Muller, Reynolds, Wrangham, & Zuberbühler, 2011) did not lead Sonso chimpanzees to use sticks. Why is that?

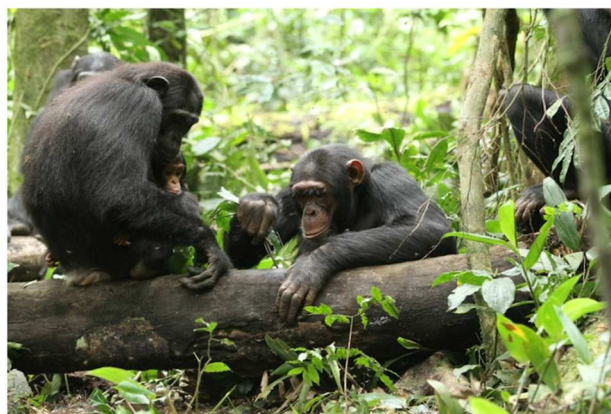


Figure 1: A member of the Kanyawara community of Kibale Forest, Uganda, extracting honey from the honey-trap with a stick during an experimental trial (Courtesy of Andrew Bernard).

Representing Cultural Knowledge

While the Sonso chimpanzees have experienced drastic difficulties in developing stick use, in 2011, they found it easy to develop a new tool use behavior: moss-sponging, the use of moss instead of leaves to manufacture sponges. Together with my colleague Dr. Cat Hobaiter, we documented the spread this novel tool use in the Sonso community. Incidentally, this publication was the first to document, using social network analysis, the spread of a novel tool use in wild chimpanzees (Hobaiter, Poisot, Zuberbühler, Hoppitt, & Gruber, 2014). Further work conducted by PhD student Noémie Lamon showed that the transmission pattern, after an initial ‘ecologically-based’ trigger, followed kin affiliations (Lamon, Neumann, Gruber, & Zuberbühler, 2017). In further work, we also showed that moss-sponges are more efficient than ancestral leaf-sponges (Lamon, Neumann, Gier, Zuberbühler, & Gruber, 2018).

Together, these results suggest that wild chimpanzees can extend their cultures in the vicinity of what they already know. However, it becomes harder for them to expand these cultures to unknown material or substrates, raising doubts about their abilities to fully represent their cultures (Gruber, Zuberbühler, Clément, & van Schaik, 2015). This is despite the fact that they are able to represent some parts of their knowledge, including efficiency (Lamon, et al., 2018); and the fact that certain objects are used as tools while others are not (Gruber, Frick, Hirata, Adachi, & Biro, 2019). Yet, this cognitive approach must be completed with affective aspects if one wants a full picture of chimpanzee cultures.

Adding Socio-Emotional Motivations to the Model

A possible answer to the limited tool use in Sonso has been that chimpanzees simply did not need them because of ample food supplies (Reynolds, 2005). Over a decade, our experimental work has confirmed the absence of stick use in Budongo Forest and our ecological surveys broadly support the idea that Budongo chimpanzees indeed have benefited from an ideal supply of food over the past decades. However, the pattern of engagement with the honey-trap experiment over eight years also suggested that necessity, alongside opportunity (presence of tools and substrate), is a major factor for tool use, with chimpanzees engaging more with feeding opportunities using tools when food is scarce and that they travel longer to obtain it (Gruber, Zuberbühler, & Neumann, 2016). This first incursion in the domain of affect (here under the scope of a general motivation to use tools), has proven instrumental to build a new model of social learning that integrates several domains of the literature that have remained strangely dissociated.

Debates concerning social learning in the behavioral sciences have indeed largely ignored the literature on social influences in the affective sciences, despite having arguably the same object of study. In a recent preprint (Gruber, Bazhydai, Sievers, Clément, & Dukes, 2020), we argue that this is a mistake and that no complete model of social learning can exclude an affective aspect. In addition, we argue that affect can allow bridging of the debates of the unique characteristics of social learning in humans compared to other animals. We review the two major bodies of literature in non-human animals and human development, highlighting the fact that the former has adopted a behavioral approach while the latter has adopted a cognitive approach, leading to irreconcilable differences. We then introduce a novel framework, *affective social learning* (ASL), which studies the way we and other species learn about value(s). All in all, the affective, behavioral and cognitive approaches are complementary and focus, respectively, on feelings about, behavior towards, and cognitions concerning objects, events and people in our environment. All three thus contribute to an affective, behavioral and cognitive story of knowledge transmission: the ABC of social learning. We argue that this novel perspective on the debate concerning social learning can allow both evolutionary continuity and ontogenetic development by lowering the cognitive thresholds that appear often too complex for other species and non-verbal infants. Yet, it can also explain some of the major achievements only found in human cultures.

Acknowledgments

This work has been funded by a variety of grants and funders including the Leverhulme Trust, the Fyssen Foundation, the European Commission under the FP7 Marie-Curie scheme, and the Swiss National Science Foundation (SNSF). Current funding includes an Eccellenza Fellowship from the SNSF (Grant PCEFP1_186832).

References

- Gruber, T., Bazhydai, M., Sievers, C., Clément, F., & Dukes, D. (2020). The ABC of social learning: Affect, Behaviour and Cognition. *PsyArXiv*. doi: 10.31234/osf.io/wyhp7
- Gruber, T., Frick, A., Hirata, S., Adachi, I., & Biro, D. (2019). Spontaneous categorization of tools based on observation in children and chimpanzees. *Scientific Reports*, 9(1), 18256. doi: 10.1038/s41598-019-54345-1
- Gruber, T., Muller, M. N., Reynolds, V., Wrangham, R. W., & Zuberbühler, K. (2011). Community-specific evaluation of tool affordances in wild chimpanzees. *Scientific Reports*, 1, 128. doi: 10.1038/srep00128
- Gruber, T., Muller, M. N., Strimling, P., Wrangham, R. W., & Zuberbühler, K. (2009). Wild chimpanzees rely on cultural knowledge to solve an experimental honey acquisition task. *Current Biology*, 19, 1806-1810.
- Gruber, T., Zuberbühler, K., Clément, F., & van Schaik, C. P. (2015). Apes have culture but may not know that they do. *Frontiers in Psychology*, 6, 91. doi: 10.3389/fpsyg.2015.00091
- Gruber, T., Zuberbühler, K., & Neumann, C. (2016). Travel fosters tool use in wild chimpanzees. *eLife*, 10.7554/eLife.16371.
- Hobaiter, C., Poisot, T., Zuberbühler, K., Hoppitt, W., & Gruber, T. (2014). Social network analysis shows direct evidence for social transmission of tool use in wild chimpanzees. *PLOS Biology*, 12(9), e1001960.
- Lamon, N., Neumann, C., Gier, J., Zuberbühler, K., & Gruber, T. (2018). Wild chimpanzees select tool material based on efficiency and knowledge. *Proceedings of the Royal Society B: Biological Sciences*, 285, 20181715.
- Lamon, N., Neumann, C., Gruber, T., & Zuberbühler, K. (2017). Kin-based cultural transmission of tool use in wild chimpanzees. *Science Advances*, 3(4), e1602750.
- Reynolds, V. (2005). *The chimpanzees of the Budongo forest: Ecology, behaviour and conservation*. Oxford: Oxford University Press.