The "why" of human reasoning and communication:

Cognitive capacities through the evolutionary lens

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Introduction

{sec:introduction}

Two cognitive skills that are often considered to set humans apart from their evolutionarily closest relatives are on the one hand our outstanding capacity for reasoning, and on the other our profound communicative abilities. Broadly considered to be unmatched in the animal kingdom are on the one hand our sophisticated reasoning abilities and on the other hand our communication using languages that are infinitely creative in enabling the production of complex sentences (Cheney and Seyfarth, 1997).

source?

explicate this; source?

Our reasoning and communication are intertwined with each other in different ways; it is hard to imagine our communication without reasoning. In our everyday lives, a lot of the content we intend to convey to others, we relay pragmatically: we do not literally spell out these things, but rather hope and expect our interlocutors to infer the intended message from the communicated content. When I ask my dinner partner if they can pass me the salt, they infer that I am not interested in learning about their ability to pass me the salt but rather that I am requesting to be passed the salt. When I give feedback on an interlocutor's behavior, I first reason about how my words will come across to her in order to minimize social conflict.

source?

It is thus easy to see that reasoning and communication are intricately linked. But what is exactly the extent and nature of this link? In 2011, Hugo Mercier and Dan Sperber proposed a revolutionary theory of reasoning that intended to account for a number of issues in the experimental psychology of reasoning. According to their *argumentative theory of reasoning*, the main function of reasoning in humans is argumentative; that is, reasoning evolved in humans in order to devise arguments and evaluate those of others. Their theory is able to explain a number of properties of human reasoning, such as poor performance on historically standard reasoning tasks such as the Wason selection task; confirmation bias; and the phenomenon of motivated reasoning leading to attitude polarization.

can I say that?

add sources?

In the words of Mercier and Sperber,

> Reasoning has evolved and persisted mainly because it makes human communication more effective and advantageous. (Mercier and Sperber, 2011, p. 60)

In this thesis, I intend to scrutinize this position and take it further, in order to ultimately answer the question of whether advanced reasoning skills in humans evolved because they facilitate more advanced communication.

In order to answer this research question, after addressing methodological considerations on functions and explanations in evolutionary biology, I will at length consider the argumentative theory of Hugo Mercier and Dan Sperber (Mercier, 2016; Mercier and Sperber, 2011, 2017). Then, an exploration of the origins of human communication is in order (Benítez-Burraco, Ferretti, and Progovac, 2021; Moore, 2017; Scott-Phillips, 2017, 2018; Tomasello, 2008).

1 | The chicken and the egg: exploring the evolutionary approach

Before we are able to answer any *why*-questions about humans' cognitive capacities, some groundwork needs to be laid out. For what does it mean for some trait to evolve 'because of' or 'for the purpose of' another trait? Are we even justified in using this kind of terminology when it comes to evolution, which is a process which cannot be said to be intentional nor purposeful? And what questions will we need to ask ourselves in order to ultimately answer that big *why*-question? This chapter attempts to answer these questions. It by no means provides an overview of issues in evolutionary theory; this is a large field of research in its own right, with widely diverging opinions on a number of specifics of evolution (see Ariew, Cummins, and Perlman (2002) and Uller and Laland (2019) for overviews of topics in evolutionary theory). This chapter will merely serve to get a number of issues out of the way before we can continue our investigation into the cognitive mechanisms that make us human.

1.1 Causation in evolution

:causation-evolution}

Now, we will dip our toes into the waters of causation in evolution.

Evolutionary causation is a subfield of philosophy of biology that has continued to see wildly diverging opinions (Baedke, 2021; Uller and Laland, 2019). In this section I will restrict focus on three topics in evolutionary causation that are of interest to this thesis: proximate vs. ultimate causation; Tinbergen's four questions; and reciprocal causation and niche construction. The former will serve to illuminate some basic aspects of the issues evolutionary causation concerns itself with, and the latter is of particular interest in considering the evolution of human cognition.

In evolutionary causation, one may distinguish *proximate* from *ultimate* causes. Proximate causes are the immediate influences on a trait; proximate causes explain how the trait results from the internal and external factors causing it. Ultimate causes serve more as the historical explanation of those traits (Mayr, 1961). In a way, these two different causes answer two different explanatory questions: the proximate cause is the answer to the *how*-question, whereas the ultimate cause answers the *why*-question. One needs to answer both of these questions in order to provide a complete understanding of the phenomenon.

this paragraph deserves some rewriting

By some considered to be an extension of this distinction, Tinbergen, 1963 has influentially proposed four questions to be central to the study of animal behavior. In order to fully understand a pattern of behavior, one must consider the proximate causation of the

behavior, the lifetime development of the behavior, the function[1] of the behavior, and lastly the evolutionary history of the behavior.

While Mayr's and Tinbergen's frameworks have had great explanatory value in the field of evolutionary causation, it has been argued (Laland, Odling-Smee, et al., 2013) that biologists would be better off rejecting them in favor of a framework of *reciprocal causation*. In a framework of reciprocal causation, there is feedback between the organism and its environment: not only does the environment influence the organism through the process of natural selection, but the organism influences the environment through the process of *niche construction* (Svensson, 2018). Niche construction which posits that organisms may actively partake in modifying their environment and shaping their niche. It has been argued that niche construction is at least as important as natural selection in shaping evolution (Svensson, 2018).

example?

1.2 The legitimacy of evolutionary psychology

In order to answer our question, we will first zoom out to consider the field of evolutionary psychology as a whole. What is the merit, and the validity, of adopting an evolutionary approach in our endeavor?

The field of evolutionary psychology concerns itself with trying to understand human behavior through evolutionary theory, by looking into the past and considering how our ancestors must have adapted to their environment. Researchers in the social sciences and humanities have historically been a tad wary of using evolutionary approaches to study human behavior, because evolutionary theory has been abused for prejudiced ends in the past (Laland and Brown, 2002, pp. 19–20). However, evolutionary psychology has proved to be a illuminating field of study over the past decades.

In order to explain humans' evolved psychological mechanisms, evolutionary psychologists look to the concept of an *environment of evolutionary adaptedness* (EEA). The EEA is the environment in which these psychological mechanisms must have come into being; usually the EEA is identified as hunting and gathering groups on the African savannah in the second half of the Pleistocene, between 1.7 million and 10,000 years ago (Laland and Brown, 2002). The assumptions underlying the use of the concept of an EEA are that (1) our modern-day environment is too different from that of our ancestors for us to use it to explain why and how our psychological mechanisms evolved in the past; and (2), for our psychological mechanisms to be as complex as they are, they must have evolved slowly and thus at a considerable amount of time prior to the present, and they have not changed significantly since the Stone Age.

that's kind of a weird comment, but i needed to counterbalance it somehow

There are a number of issues associated with the use of the concept of the EEA (Laland and Brown, 2002). Firstly, we do not know very much about the environment of our ancestors, so the specifics of the EEA may be filled in as is seen fit for one's purpose. Secondly, we do not know enough about the process of evolution to make assumption (2); while evolution does in general operate on a large time scale, research has shown that it can also be faster, operating on a time scale of thousand of years, or less than 100 generations (Laland and Brown, 2002, pp. 190–191 and references therein). Thirdly, the argument can be made that for our species to have flourished and dominated in the way that it did, we must have remained adaptive to our changing modern environments after the Stone Age. Fourthly,

[1] Visit Section 1.3 for an exposition of function

the EEA argument does not take into account reciprocal causation or niche construction, as discussed in Section 1.1.

For our endeavor at hand, I accept the concept of the EEA in a general sense despite its flaws; for our purposes, we need not commit to any strong assumptions about the nature and properties of the EEA. The most important assumption I will make is that homo sapiens throughout history has been dependent on strong social groups for survival.

i will need to argue here why i DO make this assumption, because it's maybe not justified? see Laland and Brown (2002, p. 178)

Another topic of discussion in evolutionary psychology that is of importance to our investigation, is that of domain specificity of the evolved psychological mechanisms. The argument has been made (Buss, 2015, p. 50) that these adaptive mechanisms are problem- or domain-specific, because the evolutionary process would not favor general solutions to specific problems. However, as with the EEA, there are some issues with this stance (Laland and Brown, 2002): the push to domain-specificity can be said to rely on too strong assumptions about the modularity of the brain; and moreover, there is also a push to domain-generality of cognitive skills because they are neurologically more cost-efficient.

should this last paragraph go in another section? in the last one? it's maybe not really related to this section

Lastly, it is important to note here that not only biological evolution, but also cultural evolution can be said to have played a role in shaping human behavior and human cognitive capacities; it is a joint endeavor facilitated by nature and nurture. In this thesis, I will not attempt to delineate between what features are due to biological evolution and which are due to cultural evolution; for the purposes of this investigation, I believe I am justified in broadly considering them under the umbrella term of 'evolution'.

1.3 Teleological notions in evolutionary theory

{sec:teleology}

Next up, it is useful to scrutinize the terminology that I will be using throughout this thesis. Biological literature frequently make use of teleological terminology, that is, terminology that implies goal-directedness of the processes it describes. Such terminology includes concepts like the *design* of a trait, and *function*, *purpose*, or *utility* of a trait. At first glance, the usage of these terms in dealing with evolution would seem to be inappropriate; evolution is a natural process, that is not performed by an agent, not with any intentionality, direction, or end-goal. And indeed, this teleological terminology has its origin in pre-Darwinian and creationist views on the origin of species.

this segue needs to be rewritten

However, they have considerable instrumental value in describing evolutionary processes. Throughout this thesis, I will be adhering to the conception of teleological explanations as proposed by Ayala (1999), which is as follows:

> Teleological explanations account for the existence of a certain feature in a system by demonstrating the feature's contribution to a specific property or state of the system, in such a way that this contribution is *the reason why the feature or behaviour exists at all*.
> (p. 13)

In this respect, the evolutionary process of adaptation merits a teleological explanation; the function of a trait (its 'contribution to a specific property or state of the system') is the reason that the trait exists, because it exists as a consequence of natural selection. Natural selection can be said to be directed or oriented; the direction of evolution is determined by the functional utility of the trait to the organism.

do i need to sidenote this with the fact that it's too simplistic and/or ignores reciprocal causation and niche construction?

The distinction between proximate and ultimate causes (Section 1.1) can be applied to teleological explanation, resulting in the distinction between proximate and ultimate *ends*

of features. The proximate end is then the 'immediate' function the feature serves , and the ultimate end is the reproductive success of the organism. Ayala distinguishes between *natural* and *artificial* teleology, which concerns whether the feature is a result of a natural process or rather by purposeful action, consciously intended by an agent.

A footnote to this whole story is that not all features of organisms can be explained teleologically; only if the feature has arisen and persisted as a direct result of natural selection, is a teleological explanation in place.

In general, teleological explanations in biology are quite controversial: not only is the usage of the specific terminology itself debated (Ayala, 1999, p. 27 and references therein), the concept has been criticized for its apparent lack of formalization and insufficient argumentative persuasiveness (Baedke, 2021, p. 83).

is this relevant?

this "direct result of natural selection" is very vague, make a note of this?

finish this up with a rebuttal or last point

1.4 An evolutionary foundation

Now that we have gathered the puzzle pieces, it is time to return to our field of investigation and lay the groundwork for it. In particular, before we can continue with executing our evolutionary approach to human reasoning and communication in the next chapters, we will need to outline and justify the assumptions made.

As we have seen, it seems that for none of the topics in evolutionary theory discussed here, consensus has been reached among its practitioners. Since the purpose of this thesis is not to provide a complete causal framework for the evolution of reasoning and communication, we will be able to cast aside some of the issues plaguing the frameworks discussed in this chapter.

Why do we consider these cognitive capacities from an evolutionary perspective?

justification of using the evolutionary approach

What do we mean when we say 'evolution'?

discussion on biology vs. culture: see Laland, Odling-Smee, et al. (2013) and Laland and Brown (2002)

What are our assumptions about the evolutionary process?

discussion of assumptions on EEA and rejecting unidirectional causation in favor of reciprocal causation

What questions will we need to answer?

tinbergen's questions?

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