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A Cognitive and Evolutionary Approach

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Article abstract

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Does Argumentation Change Minds? A Cognitive and Evolutionary Approach

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"Don't stop thinking about tomorrow
Don't stop, it'll soon be here"
-Fleetwood Mac

Abstract: Our intuition is straightforward: yes, argumentation changes minds. But many cognitive and discursive habits suggest otherwise. As the literature in the psychology of reasoning incessantly emphasizes, we hardly change our minds because a predisposed robust confirmation bias (or myside bias) is at work when we argue. To adequately answer the questions of why, how, and if argumentation changes minds, I frame the problem from an evolutionary perspective. I argue argumentative competence changes minds because its ultimate goal is to construct the future, to predict more accurately. This converges with evolutionary analyses of other cognitive skills and cultural inventions. To explain my perspective, I use the distinction between ultimate and proximal goals of a trait.

Résumé: Notre intuition est simple: oui, l'argumentation change les mentalités. Mais de nombreuses habitudes cognitives et discursives suggèrent le contraire. Comme le soulignent sans cesse les écrits sur la psychologie du raisonnement, nous ne changeons guère d'avis parce qu'un biais de confirmation robuste (ou biais de-mon-côté) prédisposé est à l'œuvre lorsque nous argumentons. Pour répondre adéquatement aux questions de pourquoi, comment et si l'argumentation change les mentalités, je pose le problème dans une perspective évolutionniste. Je soutiens que la compétence argumentative change les mentalités parce que son but ultime est de construire l'avenir, de prédire avec plus de précision. Cela converge avec les analyses évolutionnistes d'autres compétences cognitives et inventions culturelles. Pour expliquer ma perspective, j'utilise la distinction entre les buts ultimes et proximaux d'un trait.

Keywords: adaptation, argumentation, control, evolution, prediction, ultimate and proximal functions.

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1. Introduction

Argumentation competence is part of a broader cognitive trait of inventing and predicting the future, i.e. our unique ability to construct and communicate arguments and to participate in argumentative processes is at the service of foresight to control future actions and scenarios. This goal of our ability to argue is its ultimate function, and persuading, demonstrating intellectual capacity, thinking critically, or resolving a disagreement critically are proximate functions that could theoretically deepen or modify the trait over generations. This is the core idea I tried to convey in my keynote speech at OSSA 2024, and I will develop it a little further in the following pages.

From a more orthodox evolutionary perspective, to propose that a particular trait has a particular function is to claim that the trait contributes to inclusive fitness (Scott-Phillips, Dickins & West, 2011), that is, the direct and indirect ways in which a human trait contributes to the heritage of a particular gene pool.

Since the evidence to support my claim is very limited, the main argument to be explored will be that, given the fact that constructing and controlling the future by means of a communicative (mainly symbolic) faculty is a difficult task, argumentation emerges as a powerful tool to ensure a constant process of autocorrection to exclude alternative and potentially erratic points of view, courses of action, desires, emotions, intentions that affect states of mind and decisions about new scenarios and events. A constant process of self-correction is the most powerful dynamic through which both knowledge and better decisions can be achieved. The individual and the community that, based on argumentation, improve their information pool, could better secure their specific gene pool. This would be an indirect way in which argumentative cognitive ability could contribute to inclusive fitness.[1]

[1] From a more general perspective, Sterelny (2003) refers to this as *epistemic engineering*, a process that contributes decisively to niche construction, i.e. the environments that humans create to satisfy their needs (food, shelter, etc.).

There are, of course, a number of problems and dangerous pitfalls on the road to inventing the future. One is the optimist bias, the tendency to underestimate the likelihood of contradictory scenarios or events and to overestimate the likelihood of scenarios that one predicts. Another problem, as Suddendorf, Redshaw and Bulley (2022) point out, is Kahneman's planning fallacy, i.e. people's tendency to predict that plans will be carried out more quickly than they usually are. The list of biases and heuristics that can interfere with the process of self-correction is long and already well explained (Gigerenzer, 2007; Todd et al., 2012). However, these obstacles are not a handicap. Our ability to exchange arguments is more robust than these selfish tendencies, otherwise the ability itself would be extinct as a cognitive trait.

To explain my position, the paper proceeds as follows. In section 2, I discuss the view of the central role of prediction and its implications for human cognitive development. In section 3, I briefly reflect on the distinction between ultimate and proximate goals in order to emphasize the need to adopt an unambiguously complementary position between them;[2] in section 4, I describe the predominant role of the cultural background of the ability to argue, in line with the way in which culturally transmitted information influences gene modification and hence inclusive fitness; in section 5, I further develop my main argument, that is, argumentation as a robust autocorrection process; finally, in the conclusion, I offer some properties that a cognitive agent should fulfil in order to become a robust argumentative subject (a good arguer).

My keynote speech attempted to respond strictly to the theme of the 13th OSSA Conference, which was: Argumentation and Mind Change. My straightforward answer is that argumentation changes minds, which is its ultimate evolutionary and cognitive function. Another problem is the speed or social rhythm with which it does this; another delicate problem is the moral orientation with which the faculty fulfils its function. The assumption, of course, is that by changing the mind we actually change the future. Isn't that so?

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[2] Elsewhere (Santibáñez, 2015b, 2024), I have used the distinction between *proper* and *derived* functions to explain the main role of argumentative competence. In this paper, I delve into the distinction between ultimate and proximate functions in order to reconsider my own position.

2. Prediction and human evolution

Suddendorf, Redshaw and Bulley (2022) propose that:

> Prediction is at the core of brain function across the animal kingdom... Our ancestors gradually acquired their remarkable mental time machines over millions of years, leaving clues of their advancing capacities in the form of carefully crafted stone tools and the remnants of firepits... Recognizing the future utility of solutions and of teaching others, they set in motion a feedback loop of cultural accumulation... They noted the regularities of their world and innovated tools like calendars, money, and writing that dramatically improved their ability to coordinate future events. (p.199)

Suddendorf, Redshaw and Bulley (2022) follow an old path of discovery and reflection in proposing that prospection is a core human trait. As Bulley (2018) has described in detail, the study of prediction has a long history and a fine pedigree. From a contemporary perspective, Craik (1943) was an important author in reinvigorating this line of thought. Craik (1943, pp. 59-61) pointed out that: "If the organism carries a 'small-scale model' of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilize the knowledge of past events in dealing with the present and the future, and in every way to react in a much fuller, safe, and more competent manner to the emergencies which face it."

Clark (2016) is now one of the most ardent defenders of this line of research. Clark (2016) uses the term active inference to refer to the way in which biological agents can reduce prediction errors. Active inference consists of at least two ways of reducing errors: finding the predictions that best fit the current sensory input, and taking actions that make our predictions come true: "'Active inference' … then name the combined mechanism by which perceptual and motor systems conspire to reduce prediction error using twin strategies of altering predictions to fit the world, and altering the world to fit the predictions. This general schema may also -perhaps more transparently- be labelled 'action-oriented predictive processing." (p. 122) In the case of human agents, action-oriented predictive processing relies on deliberate practices of fulfilling motivated future realities,

combining imagination, simulation, Bayesian inference calculations, and other *cognitive gadgets* (Heyes, 2018). As Bulley, Redshaw and Suddendorf (2020, p. 427)[3] point out in an earlier publication "fire, craft and use a sturdy weapon, or play an instrument, one must attain mastery of a skill. Any practicing requires thinking about one's future self as alterable. Once an upgraded future self can be envisioned, say with improved abilities and knowledge, people can become motivated to pursue steps towards making this a reality."

One of the key mechanisms that enables this fine-tuning of perception is the selective use of error. To update its beliefs, the brain exploits the difference between predictions and what actually happens. As illustrated by Suddendorf, Redshaw and Bulley (2022)

> If you are ever popped an olive into your mouth thinking it was a grape, or waved across the room at a friend only to realize she was actually a stranger, then you know how it feels to make an error of sensory prediction. Very rapidly, you come to expect the next appetizer to be savory rather than sweet, the stranger to give you a puzzle glance rather than a warm smile... The brain is constantly managing far more subtle errors of prediction and relentlessly updating hypothesis about the causes of sensory input. (pp. 71-72)

However, Clark (2016) highlights that predictive learning, imagination and limited forms of simulation are also exhibited by other mammals. So, what makes us so different? One hypothesis, says Clark, is that adaptations of the human neural system have created a more complex and context-flexible hierarchical learning system. Another hypothesis is that our capacity for temporally coordinated social interaction, and our ability to create artefacts and design environments, make us different, because: "Human minds permeable to

[3] In this paper, the authors specifically address the role of imagination within the cognitive capacity for foresight. The authors explain that imagination paves the way for metaforesight, i.e. the ability to, among other things, compensate for anticipated limitations. As we know, humans are perhaps uniquely capable of metarepresentational insight. Metarepresentation is the name given to the ongoing evaluation of how imagined scenarios fit into the external world. As a vast literature has shown, this ability is a core aspect of childhood development. Others refer to it as mindreading (Mameli, 2001) or mindvaults or mindshaping (Zawidzki, 2013). It is important to develop the ability to understand the minds of others, but also to develop conditional and counterfactual thinking, both of which are higher-order simulation capacities that have significant implications for argumentative competence (Santibáñez, 2015a).

the statistical structure of the action-ready" (p. 276). Sterelny (2003) has labelled this as 'incremental downstream epistemic engineering'.

For this constant or incremental epistemic engineering, the invention of symbolic inscriptions was and is essential (mathematics, writing, reading, structured discussions). Clark explains this as follows:

> …those training signals are now delivered as part of a complex developmental web that gradually come to include all the complex regularities embodied in the of statistical relations among the symbols and other forms of sociocultural scaffolding in which we are immersed. We thus self-construct a kind of rolling 'cognitive niche' able to induce the acquisition of generative models whose reach, and depth far exceeds their apparent base in simple forms of sensory contact with the world. (p. 277).

One of the most salient features of the loop contained in Clark's idea is that words predict the occurrence of other words once a linguiform is launched and re-entered into our own cognitive system. This is exactly what the generative dynamic of AI such as ChatGPT does: the robot's ability lies in the input of linguistic tokens to predict the manifestation of other tokens.

What are the specific consequences of these innovations within the constantly predictive human machine? As Clark (2016) summarizes, we have our own thoughts and ideas available as perceptible objects for deliberative processes of attention. The possibility is open that we can improve our knowledge through systematic testing, asking reasons, distributed and peer review. Clark (2016) points out that:

> Our best models of the world are thus able to serve as the basis for cumulative, communally distributed reasoning… The same potent predictive processing regimes, now targeting these brand new types of statistically pregnant 'designer inputs', are then enabled to discover and refine new generative models… The upshot is that the human-built (material and sociocultural) environment becomes a potent source of new transmissible structure that trains, triggers, and repeatedly transforms the activity of the prediction-hungry biological brain. (p. 279)

Evolutionary, biological, neurological and anthropological evidence is discussed at length in the literature cited above to conclude what

Clark and many others argue, namely that one of our major cognitive faculties is organized in such a way that its core function is to predict the future in order to control scenarios, produce innovations and structure the external world. In this cognitive environment, the ability to reason contributes decisively to this task. The social activity of communicating, sharing and challenging reasons and points of view is the most robust capacity to ensure autocorrection and thus to model future epistemic, action and intentional contexts. This activity condenses into reasons and points of view all the material and symbolic innovations (images, sounds, signs, language) that feed the loops of inferential processes that contain alternative worlds.[4]

3. Ultimate and proximal function' distinction

The distinction between proximate and ultimate (causal) functions of behavior can be traced back, at least, to Mayr (1961) and Tinbergen (1961; see also Laland et al., 2011; Scott-Phillips, Dickins & West, 2011). Mayr was concerned with causal explantation in biology. To explain the distinction, Mayr (1961) pointed out that:

> Now, if we look over the four causations of the migration of this bird once more we can readily see that there is an immediate set of causes of the migration, consisting of the physiological condition of the bird interacting with photoperiodicity and drop in temperature. We might call these the proximate causes of migration. The other two causes, the lack of food during winter and the genetic disposition of the bird, are the ultimate causes. These are causes that have a history and that have been incorporated into the system through many thousands of generations of natural selection. It is evident that the functional biologist would be concerned with analysis of the proximate causes, while the evolutionary biologist would be concerned with analysis of the ultimate causes. (p. 1503)

Thus, ultimate causes refer to the history of a trait in terms of selective advantage, its evolutionary function (Laland et al., 2011),

[4] I have discussed elsewhere the recursive dynamic of inferential process (Santibáñez, 2021). Note that even more basic cognitive human traits have the same nature, such as the memory. As Bulley (2018) reminds, the information stored during our lived experiences articulate building blocks for prospection: "The ability to generate novel expectations about future events, especially in the form of narratives, relies in part on the recursive nesting of that information." (p. 83)

and proximate causes refer to the mechanisms that explain specific behaviours, how they work ('immediate causal triggers', Scott-Phillips, Dickins & West, 2011: 38). Both levels are complementary.[5] Particular behaviours could match ultimate functions to keep the selective advantage.

Central to this distinction is the concept of inclusive fitness. As Scott-Phillips, Dickins and West (2011: 45) emphasise, the concept refers to the metrics by which natural selection operates.[6] If one variant of a trait is more common in a population, then it contributes more to inclusive fitness than others. In other words, an explanation for why one trait is more common than another in a population is an ultimate functional explanation. An ultimate level question refers to why a behaviour exists at all (Scott-Phillips, Dickins & West, 2011. p. 40); a proximate question refers to the description of one or more causal triggers of the expression of a behaviour.

To conclude this brief section, it is important to recall Laland et al.'s (2011. p. 1515-16) argument about in what sense Mayr's distinction is still valuable and in what sense it should not be taken for granted. Mayr's distinction is valuable because we should not confuse ultimate and proximate explanations as alternatives. The problematic aspect of the distinction is that the complementarity between them is scientifically useful not as a strict biological separation, but as an essential part of the way in which natural selection actually operates. We need to recognise that developmental processes sometimes play an important role in explaining why some traits have the properties they do. The next section will deal with some of this.

[5] It is important to note that these authors are addressing the problem of the use of the distinction within the social and psychological sciences. It is very common, they say, for scholars working on social cooperation (such as Cosmides when she explained the evolutionary function of reasoning) and cultural transmission to conflate the two levels. This problem could arise, according to Scott-Phillips, Dickins & West, (2011: 41-42), because social scientists have never asked themselves about the ultimate function, or because in evolutionary theory (from a biological perspective) some terms are used in a different way, or because in the social and psychological literature the use of intentional language to describe behavior usually refers to mental motivation, and in evolutionary theory intentional language is used in terms of strategies that maximize fitness.

[6] A specific mathematical metric within inclusive fitness is Hamilton's rule, which measures indirect effects on gene frequency.

4. Cultural accumulative change

In recent decades (Laland & Brown, 2002), there has been an ongoing and controversial debate about how developmental processes, epigenetics and cultural processes influence genetic change and inheritance (Lewontin 1983; Odling-Smee, Laland & Feldman 2003),[7] to put it succinctly. My concern in this section will be with just a few ideas about how cultural information processes interact with genetic transformation.[8] The specific aim here, as noted in the introduction, is to see the elemental and natural cultural background of argumentative competence as a dynamic of autocorrection.

The constant transfer of information is the source of cultural evolution, which goes hand in hand with genetic evolution and sometimes puts selective pressure on it (Henrich 2016). The anatomy of human feet explains why we are the only species that can run long distances (a marathon!): we had to reach social sources, groups with vital or useful information or goods (products), long ago and in a relatively short time. The distributed cultural wealth exerted selective pressure to generate genetic changes that had phenotypic consequences in the members of such groups.

A couple of different angles from which to critically consider the need to incorporate a broader approach to gene change and inclusive fitness are the *developmental niche theory* (West & King 1987; West, King & Arberg 1988) and the *cognitive gadget theory* (Heyes 2018) mentioned above. The first perspective emphasizes that agents inherit not only genes, but also exogenous resources for the survival of future generations. (Stotz 2017).[9] One of the main theoretical

[7] An example of this ongoing debate is the controversies surrounding epigenetics. See Ginsburg & Jablonka (2019: 314-321) for examples and discussion.

[8] Laland and Brown (2002: 241-2) sum up the problem in crystal clear terms: "… comparative evidence for social learning in a variety of vertebrate species suggests that cultural transmission appeared long before the advent of our genus. However, social learning in other animals is rarely stable enough to support traditions in which significant amounts of information accumulate from one generation to the next. For at least two million years, our ancestors have reliably inherited two kinds of information, one encoded by genes, the other by culture. How does the dual inheritance affect the evolutionary process?"

[9] Stotz (2017: 4) describes it as follows: "A reliably reproduced developmental system is the result of the reliable provision of a wide range of developmental resources necessary to reconstruct the organism's life cycle. But transmitted resources are sensitive to the parents' environment and can be modified accordingly to prepare the offspring to changed ecological circumstances. Beyond DNA, additional and equally necessary resources are epigenetic

points of this perspective is that the development and learning of organisms within their niches is absolutely necessary, both for the way they evolve and for understanding the specific characteristics they possess. Heyes (2018, p. 219) indicates that her theory "suggests that distinctively human cognitive mechanisms are adaptive because they are shaped primarily by cultural evolution, not y genetic evolution or intelligent design…",[10] and, in particular, ignores genetic assimilation as the main driver of important human traits. For my specific purposes here, it is worth quoting the following:

> Many cognitive mechanisms, like imitation and mindreading, not only do their job well, but do jobs that, when done well, seem likely to enhance *reproductive fitness -to increase the number of babies produced by the bearers of the cognitive mechanism*. This has led some researchers to assume that, even if new cognitive mechanisms are produced by learning in a culture-soaked environment, they will later become genetically assimilated. In other words, they may start out as cognitive gadgets, constructed in the course of development thorough social interaction, but then selection will progressively favor genetic mutations that reduce the experience-dependence of the gadgets' development, converting them into cognitive instinct (Henrich 2015). (Heyes 2018, p. 207: italics added).

What would have been the social conditions that would have favored the flourishing of argumentative competence? Probably, as with many other cognitive mechanisms,[11] groups of agents of considerable size to ensure stability of transmission between generations; greater mental capacity in terms of memory (to remember the trajectories of arguments); flexibilization of strict hierarchical group relations (an assumption of symbolic power over physical and kinship

modifications, cellular structures, nutrients, gut organisms, parental care and for many species the social environment. Organisms have developed a range of strategies to construct and modify the developmental niche for their offspring to guide the developmental process."

[10] It should be noted here that Heyes, it seems to me, replaces the distinction between ultimate and proximate functions with a 'force theory' and a 'narrative theory', that is, as she indicates (2018: 12), a chronology of human evolution in terms of processes and history of events respectively. Heyes postulates that her theory is a force theory, concerned primarily with the processes that have shaped the human mind, and sees learning and cultural evolution as dominant among these processes.

[11] Language is one of them (Heyes, 2018; Johansson, 2021)

patterns) and, among many other necessary conditions to be studied, a capacity for fine-tuning attention.[12]

As noted elsewhere (Santibáñez 2024), argumentative competence should be related to the presence of a stable symbolic communication system and most likely to language to ensure the exchange of representations (reasons):

> If we consider language to be between 70 and 100 thousand years old (MacNeilage, 2008; Bickerton, 1990; Anderson, 2011), we could be in the late Pleistocene, and according to Sterelny (2012; but also Bowles & Gintis, 2011; Richerson & Boyd, 1999, 2005), this era was characterized by a continuously violent environment, in which different human groups competed inter-group for food and shelter, and intra-group to try to control those who did not have a behavior governed by reciprocity. In this context, it would have been advantageous to have a competence that would allow the members of a group both to help the unproductive social judgement of free riders and to improve collective decisions through a mechanism that provided good evidence or convincing representations. In the late Pleistocene context, one of the main problems for humans was the provision of food; a sub-problem was the maintenance of cooperation to make the group's energy profitable. The solution was to have an orienting system of communication, different from the mere exchange of information, in which the different pieces of information of the different agents of the same group could be balanced, and this pattern would be shown whenever there were different and controversial solutions to basic needs (food, shelter, protection) (p .27).

Thus, a highly diverse conflictual environment was a constant challenge that the argumentative cognitive trait had to cope with, that is, it was selected as a dynamic product of a history of social interactions in which its individual members were equipped to participate in this social activity. Individually, the members do not persuade

[12] Tooby and Cosmides (1995: 1195) argue that attention must have been one of the earliest adaptations in the evolution of the human mind. They refer to basic, low-level attentional processes such as those involved in navigation and feature recognition. Spatial and feature-based attention are critical for performing critical survival tasks, such as detecting objects in the environment and identifying predators and prey. These basic forms of attention can interact with other cognitive abilities, such as long-term and short-term memory, to produce richer representations.

themselves, but make decisions based - mostly - on intuitive reasoning (Sperber & Mercier 2017; Mercier 2020).

Proximal phylogenetic evidence tends to confirm the existence of conflict as a powerful trigger of a new cognitive trait in humans. To explain the dynamics of reasoning in primates, Cummins (1996) emphasizes that, on the one hand, hierarchical dominance puts pressure on the cognitive capacity to make transitive inferences (to know and communicate who is stronger than others); on the other hand, the need to solve practical problems puts pressure on deontic reasoning. As Cummins (1996, p. 469) points out:

> The argument that Cheney and Seyfarth put forth regarding the capacity to make rank discriminations and transitive inferences is as follows: One strategy for working out dominance relations is simply to observe and remember the outcome of dyadic encounters between each pair of individuals in one's group until one can work out a sequential ordering of individuals indicating A is dominant to everyone, B to everyone but A, and so on. As group size increases, however, the number of outcomes that must be memorized grows exponentially. Another strategy is to reason transitively, that is, to infer some dominance relations based on knowledge of others: if one knows A is dominant to B, and B to C, then one can infer that A is also dominant to C without ever having observed a dyadic encounter between A and C.

As noted elsewhere (Santibáñez 2024), primates engage in all these types of reasoning, but as far as we know they do not communicate and discuss the different assessments of the environment they perceive, they simply communicate what they feel and perceive through a stable signaling system.

Our proximate causal explanations of argumentative competence retain the notion of conflict as a core necessary condition (Jacobs 1989; van Eemeren & Grootendorst 2004).[13] For the sake of my argument, I will use conflict as a synonym for disagreement. At the level of proximate (how) functions, disagreement is the trigger for the back and forth of reasons. Even in theories (mainly from a psychological point of view) that explain only reasoning (Santibáñez

[13] For an alternative view of the matter, see Aikin & Casey (2022).

2012), that is, the ability to make inferences in order to make decisions without communicating the reasons, conflict is the conceptual label that serves to identify the social or environmental challenges that humans have had to deal with (in order to form specialized cognitive modules or inferential models for this task).

From a very different and highly speculative perspective, Cooper (2003) follows the same path. In an attempt to explain how logic, actually *cognitive logic* as he calls it, became a cognitive feature in individual choice behavior, he takes conflict as the starting point. In his view, decision logic emerges from the life-history strategy of population flow, which is applied or used in the realm of individual choice behavior. For Cooper, a life-history stable strategy at the population level is problematic, "natural selection will operate to evolve a generalized capability for constructing and solving the equivalent of tree branch diagrams, a capability described as 'logical cognition'. The hypothetical life-history analysis external to the population is realized as an actual process internalized to some extent within the individual" (2001, pp. 67-68). As I argued above, flexibility is a key factor in any human cognitive achievement. In his account, Cooper introduces the idea of conditional strategies of life-history strategy as a kind of flexibility. Cooper presents it as follows:

> … suppose the organism is capable of sensing quickly whether it is on soft or harder ground as a predator approaches. Rather than having just a simple instinct for either digging or fleeing, the organism might have a conditional response, exhibiting a different behavior depending on whether it finds on a soft or a hard patch when the predator arrives… A life-history strategy of this sort is a conditional strategy…(p. 35).[14]

[14] Conditional thinking is of great importance both for cognitive structuring and for living together. The brain's basic procedure is to generate rapid hypothetical representations before making decisions. As Lawson (2004) has proposed, the brain-mind does not work in an inductively enumerative or aggregative way, but in a predictive-hypothetical way using the conditional structure if/then/then. From the age of 8, when infants use this form, the perseverance bias dominates, i.e. the inability to switch from one rule of reasoning to another when the problem requires it. Lawson's emphasis is that successfully adapted reasoning generates in the agent a habit of standard inhibition of previously unsuccessfully used hypotheses, while eliminating irrelevant information. The importance of the ability to generate conditional events and hypothetical scenarios also lies in the fact that it reflects higher levels of intentionality (Evans, 2007, 2010). In terms of hypothetical reasoning, I only need representations to believe something, but I need metarepresentations to suppose something.

In evolutionary theory and in biology in general, flexibility is a core feature of many well adapted organisms and, in turn, a key parameter for analyzing variation and adaptation (Bateson & Gluckman 2011; Oller & Griebel 2008). The relationship between selective evolutionary pressure, conditional strategy and logical cognition can be found in the following passage: "The wondrous ability to perform the approximate equivalent of a tree analysis will be referred to as logical cognition. Though still only as instinct in the broad sense of a genetically determined behavioral constraint, logical cognition involves vastly more than a lookup instinct. In degree of elaboration and specialization it is leagues beyond lookup. Though the memory requirements could be less than for a battery of separate lookup reflexes, the processing demands are more intricate. One could expect logical cognition to coevolve with, and influence the character of, the sensory apparatus, neural capacities, and behavioral capabilities in complex ways. Note the role of complexity. Decision-theoretic bushiness is a kind of environmental complexity – a kind that selects for logical cognition… The function of logical cognition is to enable the agent to deal with environmental bushiness." (pp. 58-59). He was on the right track when he naturalized analysis. As he himself put it metaphorically: "In the alternative scheme of things, logic is not the central stillness. The principles of reasoning are neither fixed, absolute, independent, nor elemental. If anything it is the evolutionary dynamic itself that is elemental. Evolution is not the law enforcer but the law giver – not so much a police force as a legislature." (Cooper 2001, p. 2)

5. Foresight, self-correction and social dynamics

We should not confuse reasoning with arguing. Although they are completely intertwined cognitive activities, making reasons public changes the whole picture. It is a different cognitive effort to reason when, at the same time, we have to choose words to present them to someone else, confront people, generate a certain reputation when

The cognitive power of this capacity is enormous, because the possibility of supposing generates the strategic ability to consider counterfactual scenarios. Counterfactual scenarios feed the dynamics of self-correction.

communicating reasons, try to anticipate reactions, among other conditions and consequences.

Given the framework of ultimate and proximate functions, the activities just mentioned configure proximate functions. From this perspective, the goals I have distinguished elsewhere (Santibáñez, 2015b, 2024) could best be seen as explanations that manifest how the argumentative trait is displayed and the benefits it generates. Among the proximate functions, argumentative activity benefits both the arguer and the interlocutor (or all parties involved in a particular exchange) by making public beliefs and coordinating new courses of action, preserving verbal or other symbolic means of conflict as its trigger.[15] The family of controversial exchanges that the label conflict could contain is composed, among other things, of different types of disagreement, strict differences of opinion, doubts, the need to resolve uncomfortable different degrees of shared beliefs. The fact that agents (feel) the need to resolve any conflictual context by means of their argumentative competence presupposes a strong component of cooperation.

Cooperation is a superstructure for many animals, and humans are no exception. Without some form of cooperation, it would have been impossible to achieve a proper equilibrium and a productive group in terms of reciprocity (Skyrms, 2004).[16] As I have summarized elsewhere (Santibáñez, 2015b, pp. 20-24), equilibrium is an interactive relationship in which participants share a degree of cognitive parity. Cognitive parity requires that agents attribute the same capabilities to each other. In argumentation, this means that we expect to receive valuable reasons for solving problems together. Consequently, equilibrium and cognitive parity have normative consequences by default.[17]

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[15]As noted elsewhere (Santibáñez 2015b), the idea that argumentative competence establishes beliefs and other mutually beneficial intentional states follows the ethological evidence that has identified the co-evolution between sender and receiver in signal communication, in which both benefit from the exchange of such signals (Griebel & Oller, 2008; Maynard, Smith & Harper, 2003).

[16] Boehm (2012) has described the evolution of moral virtues. Bowles and Gintis (2011) have explained the link between reciprocity and altruism with the need to produce valuable (communicative) signs in human groups.

[17] Contrary to Aikin & Casey (2022), the use of the lexicon of conflict does not automatically imply a lack of cooperation.

The social exchange of pondering reasons is thus a systematic mechanism of autocorrection. The autocorrective social dynamic of this cognitive competence seems to be a robust design for controlling future scenarios. It is a function that is contextually tuned to contingent needs. Even in its dark side, that is, the manipulation of others to predict and manage them to our advantage, the ultimate function of argumentation is manifested (Santibáñez 2017). In other words, because we want to know what others will think and decide in the future, we try to convince them today. Argumentation is one of the best communicative human designs (so far) to *slice the time* (Suddendorf, Redshaw & Bulley 2022). Argumentative cognitive ability kills many birds with one stone. Valuable (expected) reasons applied to the external material world help to create and maintain niches (Sterelny 2003, 2012) - as science is its paradigmatic social activity-,[18] and applied to the social subjective world, helps to tune personal and communal bonds. When argumentation helps to satisfy niches and group needs, the future is more predictable and amicable.

Conclusions

Argumentation is the cognitive activity that manifests itself socially in order to foresight the future. In this endeavor, argumentation is constantly changing minds, slowly perhaps, but inevitably in the long run. My effort has been to show that its ultimate function is precisely to predict the future through the construction of opinions and practical goals. Inventing the future today. Because argumentation uses conventional and stable signaling systems (Maynard-Smith & Harper 2003), it requires cooperation and coordination. As a robust, self-correcting social dynamic involving cognitive parity, the outcomes it produces tend to be accurate representations. For human purposes, the transmission of accurate information (in terms of beliefs and potential scenarios) becomes (and here a proximate function) an important system of localization and tracking (food, shelter, sexual partners, social hierarchies). As shown in other works (San-

[18] See Sloman & Fernbach (2018) for a lucid explanation of the social character of the construction of knowledge. From an epistemic perspective, this has been the constant effort of Kusch (see Kusch, 2002).

tibáñez 2015b), the speaker who argues with true arguments (understood in a broad sense: accurate, valid, relevant and acceptable) will see an improvement in her reputation and, at the same time, due to the reciprocal behavior that humans develop through their actions, the speaker will have more opportunities to receive arguments that benefit her.

So, what qualities should an individual cultivate to produce accurate/useful arguments? What characteristics make an individual a robust agent? On the one hand, the robust cognitive human trait is socially manifest, and on the other hand, the traits are those that enable a particular agent to become a highly efficient arguer.

By robust (individual) agent I mean the ability of a cognitive agent to flexibly persist in a characteristic and pattern of action that, under conditions of pressure or perturbation, achieves results that are beneficial to it and other agents with which it interacts. To fully appreciate what this definition implies, some characteristics are offered below:[19]

1) Argumentative plasticity: The agent should be able to adapt, in terms of beliefs and actions, with some speed and consistency to the changes produced in its epistemic environment that generate benefits, and be attentive to signs that are not necessarily fully explicit, but that nonetheless provide relevant information about new scenarios.

2) Strategic argumentative insensitivity: The argumentatively robust agent should be insensitive to changes or argumentative movements that involve harm or a waste of energy (they don't amount to individual or group benefit). Some principle of closure should operate to generate explicit responses to reject certain controversies (keeping the evaluative capacity constantly working to assess arguments that come to us directly or indirectly).

3) Basic argumentative constraints: The robust agent should have a plasticity threshold, i.e. one should not insist on an

[19] This characterization is based on Bateson and Gluckman's (2011) description of robust biological entities.

argument whose result is counterproductive, which goes against the socio-cognitive competence itself (fanaticism, extreme dogmatism, etc.). The restriction of argumentative plasticity would also be related to not developing an argument where there is no basic or sufficient information, or where the context is distorted in such a way that it only seeks to undermine the processes and procedures (e.g. eristic dialogues, dialogue of the deaf, violent political deliberation processes).

4) Argumentative elasticity: The difference with the category of plasticity is that in the face of epistemic revisions that turn out to be wrong, the robust agent should return to its original position so that the original position is not deformed by the process. This would be a kind of argumentative resilience of the robust agent.

5) Argumentative attractors: The robust agent in the argumentative process should be able to produce positive results through argumentative structures that, on the one hand, maintain their stability and consistency, and, on the other hand, allow the receiver to appreciate that such structures produce the same stability in her, if and only if the stability aimed at is virtuous and attracts imitation.

6) Argumentative redundancy: The agent in the argumentative process should be able to constantly have alternative argumentative structures and arguments if a first communicated strategy has failed. Argumentative redundancy should be tactically available whenever a disturbance is observed.

Some agents are better at prediction than others, and therefore better at controlling the environment than others. In the realm of argumentation practice, awareness of these characteristics could improve the arguer's ability. This could be an important factor in ensuring the transmission of a particular gene pool, i.e. a robust argumentative agent could be a good candidate to contribute to the inclusive fitness

of a lineage. Let's hope that those who embrace it can look forward to a better future.

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