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Article

The Origin of Human Theory-of-Mind

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Abstrac: Is there a qualitative difference between apes' and human Theory-of-Mind (or ability to estimate others' mental states)? After opting for the idea that expectations are empty profiles that recognize a particular content when it arrives, I apply the same description to 'vicarious expectations' –very probably present in apes. Thus, (empty) vicarious expectations and one's own (full) contents are distinguished without need of meta-representation. Then, three proposals are made. First, vicarious expectations are enough to support apes' Theory-of-Mind (including 'spontaneous altruism'). Second, since vicarious expectations require a profile previously built in the subject that activates them, this subject cannot activate any vicarious expectation of mental states that are intrinsically impossible for him. Third, your mental states that think of me as a distal individual are intrinsically impossible states for me, and therefore, to estimate them, I must estimate your mental *contents*. This ability (the original nucleus of human Theory-of-Mind) is essential in human lifestyle. It is involved in unpleasant and pleasant self-conscious emotions, which respectively contribute to 'social order' and to cultural innovations. More basically, it makes possible the human (prelinguistic or linguistic) communication, since it originally made possible the understanding of others' mental states as states that are addressed to me, and that are therefore impossible for me.

Keywords: human lifestyle; language evolution; mentalese; self-conscious emotions; Theory-of-Mind; vicarious expectations

1. Introduction

This article will propose that apes' Theory-of-Mind (ToM) is supported by vicarious expectations, and that these, like any other expectation, are –let's put it this metaphorical way– empty profiles that will recognize a particular content when it arrives. Thus, vicarious expectations, since they are empty profiles, can be automatically separated from the subject's own (full) mental contents. By contrast, in the human ToM, the subject estimates foreign (i.e., others') contents, which need some meta-representational resource that separates them from the subject's own contents. After having described in this way the contrast between apes' (i.e., 'primitive') and uniquely human (i.e., 'advanced') ToM, I must try to answer the following question: For what function was the estimation of foreign contents –that is, the costly duality of one's own (full) content and foreign (full) content– originally advantageous?

If it is accepted that vicarious expectations require a previous empty profile in the subject that activates them, then it must be also accepted that such expectations cannot correspond to states which are intrinsically impossible for the subject. Thus, I propose that the ability of estimating foreign contents originally arose when mental states intrinsically impossible for the subject needed to be thought in the human lifestyle. But here it is necessary to pause very briefly to deal with this lifestyle.

The new, human lifestyle, which is the key in the co-evolution genes/culture, can be characterized by two features. 1) A 'cultural' feature. 2) A 'social' one.

1) An increasing technology: This would have needed some degree of teaching (Gärdenfors 2022; Laland 2017; Tatone & Csibra 2015), or, at least, of parental approval / disapproval (Castro & Toro 2004), and, therefore, some increase in communication. But the technological increase also needs self-control, not only to acquire technological skills, but also and above all, to surpass previous cultural

products and to support creative innovations (which are the essential factor to achieve the cultural advances[1]).

2) A high degree and wide span of collaboration and 'partner choice': This would have required increasing communication (Mussavifard & Csibra 2023) and also (since there is "competition to be chosen as a partner in cooperative ventures" –Baumard et al. 2013) self-control that "refrains from blatantly selfish actions" (*ibidem*).

Returning to our thread, we must ask ourselves why actions intrinsically impossible for the subject needed to be thought in the new, human lifestyle. Self-conscious emotions (if we opt for the idea that they are originally based on an interpersonal relationship, not on an innate moral core) are advantageous because they provide the self-control necessary to care one's own reputation. In addition, the subject who experiences those emotions 'thinks what others think *of him*' (of him as a distal, foreign individual), and, therefore, he thinks a foreign mental state which, being impossible for him in any circumstances, is not graspable through vicarious expectations.

But, to get to the origin of the matter, we must focus on a basic question –how comes the human subject to think originally what others think of him. Thus, we will study the new communicative reception (not production, at the very beginning) that distinguishes human –even prelinguistic– communication from that of chimpanzees. The human addressee must think a foreign *mental* state as a state *addressed to him*. By contrast, apes can think a foreign mental state –not content, but vicarious expectation– only if this mental state is not addressed to them, and can understand that a message is addressed to them, only if there is no need of estimating foreign (i.e., the producer's) mental states.

After proposing the double identification 'apes' Theory-of-Mind / vicarious expectations', and 'human Theory-of-Mind / foreign mental contents', I will add two clarifications. Firstly, the strict condition for the very origin of 'foreign mental contents' (that is, the strict requirement that the mental states that must be thought are impossible for the subject in any circumstances) is not necessary for the subsequent development of human Theory-of-Mind. Secondly, it is convenient to focus in a more detailed way on the two receptions –by apes and by humans– of pointing gestures.

Section 2 briefly exposes the old descriptions (around the year 2003) of the primitive and the advanced Theory-of-Mind, and then presents the recent changes. Next, it focuses on three articles –Tomasello 2018, Southgate 2020, and Lurz *et al*. 2022– who attempt to accommodate the new data regarding the abilities of Theory-of-Mind in infants or apes without having to dismiss the qualitative separation of the two modes of the Theory-of-Mind. I share those authors' goal, but I do not agree with their proposals. **Section 3**, after highlighting the lack of consensus regarding the format of radically non-linguistic 'expectations', and after facing the *mentalese* (in 3.1.1), chooses to call them 'well-defined, empty profiles'. Such emptiness, which gets in any animal the automatic separation between goals and perceptions, can also be applied –I propose– to a special type of expectations, the 'vicarious expectations', very probably present in humans and apes. These special expectations are processed as 'belonging to the other' through the simplest way of the two proposed by Ereira et al. 2018, i.e., "through an encoding of agent identity intrinsic" to them. The nuclear **Section 4** –or rather 4.2– proposes that the estimation of foreign contents originally arose when mental actions intrinsically impossible for the subject needed to be thought. **Section 5** focuses on self-conscious emotions, which are essential in 'the new lifestyle' (5.1) and require the ability of estimating foreign mental contents (5.2). **Section 6** specifies that the (above mentioned) strict conditions for the evolutionary emergence of 'foreign mental contents' are not necessary for the subsequent (ontogenetic and historic) functions of the 'second line' of mental contents. **Section 7** suggests that the really effective (I will call it 'unified') reception of pointing gestures requires the estimation of the producer's mental content, and in such sense is similar to the reception of gestures and gazes that causes in the addressee self-conscious emotions, and similar to the dialogic nucleus of any linguistic reception. Finally, **Section 8** deals with the testability of all these proposals.

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[1] But population size and connectivity have been too drivers of the cultural advances and also –mainly in African Middle Stone Age– of cultural droppings: Scerri & Will 2023, Shipton 2024.

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2. The Theory-Of-Mind From 2003 Until Now

2.1. A Very Brief Summary

For the authors that accepted Theory-of-Mind around 2003, its primitive mode was the ability to know what the other sees (/ does not see) –or has (/ has not) seen immediately before. This ability is possessed, not only by children much younger than 4 years, but also (as Tomasello, Call & Hare 2003 showed) by chimpanzees. These results, soon extended to goats or ravens (see Bugnyar & Heinrich 2005 or Bugnyar et al. 2016), were explained by a very simple mechanism, namely, that the subject both tracks a line from the (visually or acoustically) perceived location of a conspecific to the relevant object and is aware of the (possible) opaque barriers obstructing that straight line.

The advanced Theory-of-Mind was linked to the ability of attributing 'false beliefs' to others. The early tests of 'false belief' show a video in which a child (Maxi) puts his marble inside a vase and then leaves; afterwards, his mother puts the marble inside his toy box and leaves. Right then, Maxi comes back, and the experimenter asks the children who have seen the video, 'Where will Maxi look for his marble?' The answers coming from children under 4 do not show the false belief which Maxi is bound to have, but their own knowledge. Within this general framework, the implicit knowledge of somebody else's false beliefs (which was observed –Clements & Perner 1994– in some 3-year olds that gave however the wrong explicit answer) did not seem to disturb the mentioned descriptions of the two modes of Theory-of-Mind.

But nowadays, there are new data. Let's begin by attending to Karg *et al*. 2015, which shows that apes' ability to estimate what the other sees (or does not see) goes well beyond its old description. These new experiments investigated whether chimpanzees could use self-experience to infer what another sees. Subjects first gained self-experience with the visual properties of an object (either opaque or see-through). In a subsequent test phase, a human agent interacted with the object and the authors tested whether chimpanzees understood that the experimenter experienced the object as opaque or as see-through. Crucially, in the test phase, the object seemed opaque to the subjects in all cases (while the experimenter could see through the one that they had experienced as see-through before). Therefore, the chimpanzees had to use their previous self-experience with the object to correctly infer whether the experimenter could or could not see when looking at the object. Chimpanzees in a competitive context (that is, when they were sufficiently motivated) successfully used their self-experience to infer what the competitor sees.

This experimental design is an 'ecological' one. Let's think of an ape that must estimate if his peer sees the object (/ the immobile object) that he, the subject-ape, sees (/ "has previously seen", Karg et al. 2016). In the wild, it is probable that the ape-subject must estimate if the foliage prevents the peer from seeing the object, but note that, since apes can often find themselves at different heights from each other, 'the possible foliage that might –or not– prevent the peer from seeing the object' is often hidden from the ape-subject's eyes. To make such estimation, he certainly could move. However, apes (heavy and lacking wings) would take too long to reach a location which would allow them to see their peer's the visual field. This problem would have been solved in apes' evolution by vicarious expectations.

There is also news regarding false-belief tasks. More concretely, since Onishi & Baillargeon 2005, numerous results in non-verbal tests have been offered in favor of the estimation of false belief by infants. That type of tests was later applied to great apes, who achieved not very different results – Krupenye *et al*. 2016, Kano *et al*. 2017. But, since the percentage rate of success in prelinguistic children, and even more, in apes, is smaller, more variable than the rate obtained in verbal tests, we must ask: Are those successes in non-verbal tests based on the same resource which supports traditional tests?

2.2. Discussing Some Proposals About The Difference Between The Primitive And Advanced Theory-Of-Mind

Before moving on to my proposal, let's see that some articles try to disconnect the new data from what would be achieved by the advanced Theory-of-Mind. We will focus on Tomasello 2018 or

Southgate 2020, and on Lurz et al. 2022, which goes in a different direction. I am close to their goal, but not to their proposals.

According to Tomasello 2018, the infant grasps others' beliefs because he "disregards his own (diverging) knowledge". In my view, such reason is not convincing, since disregarding the knowledge of the situation in which we find ourselves is at any age a non-convenient inattention. But it is also true that, as Tomasello argues, if one's own mental content, instead of being disregarded, is simultaneously carried with somebody else's content in one's own mind, then the two contents must be distinguished and compared by the subject, and thus, we would be identifying the primitive mode with the advanced one –an identification which I am opposed to.

Let us look at other account, which, being relatively like Tomasello 2018, is more recent and elaborate. Southgate 2020 (who, unlike Tomasello, doesn't mention the experiments about 'foreign false beliefs' in apes) proposes that "human infants have an altercentric bias, which results from a combination of the value that human cognition places on others, and an absence of a competing self-perspective", and that such bias causes that the events that are not co-witnessed with the protagonist of the play are encoded with less strength. (About the altercentric bias, Southgate cites Bräten 2004, and we could add Gallese 2018.) This is what explains, according to Southgate, infants' successes in non-verbal tests of false belief.

I will start by saying that I very much like the idea that for infants, the 'altercentrism' is beneficial, since it helps them to know what is relevant to others. However, I reject the alleged "weakness of self-perspective" for the same reason I rejected Tomasello's proposal that the infant "disregards his own (diverging) knowledge". Note that typical perceptions are evolutionarily much older than altercentrism and are used *at any age* much more frequently. Thus, it is unlikely that the degree of conservatism that evolution necessarily includes fails there. Certainly, while infants typically pay a lot of attention to what others look at, they sometimes do not pay attention to the event of the change of location of the object. However, according to my proposal, such lack of attention would *only* appear if the object is not salient or motivating enough for the subject, and, therefore, it would not be a consequence of 'altercentrism in the strong sense' (i.e., 'weakness of self-perspective')

Let's also focus on Lurz *et al*. 2022. This article –very different from Tomasello's or Southgate's ones– proposes that apes' success can be explained in "a simple way: Apes don't use meta-representations, but they merely simulate (/imagine) to believe what the other agent believes". But note that this simulated (/imagined) belief or "low-level simulation" (as Lurz *et al*. say) requires to attend to two contents about the same thing and to distinguish each from the other. Thus, this task, as implicit as it may be, is not "a really simpler model", as these authors defend, but is still a meta-representation.[2]

Despite rejecting Tomasello's and Southgate's idea that infants and apes "disregard their own diverging knowledge", I accept that the union of "inattention to one's own mental states" and "attention to somebody else's mental states" characterizes the primitive Theory-of-Mind. But I will propose that such inattention and such attention take place, not at the content-level, but at the expectation-level.

3. Expectations and Vicarious Expectations

After having criticized those three articles, can we keep the idea of a qualitative difference between apes' and humans' Theory-of-Mind? Let's focus on Karg et al. 2015, who, as above said, show that chimpanzees can use self-experience to infer what another sees. Probably 1) they activate their own expectations about what they would see if they were in the same location and circumstances as their peer, but 2) they process such expectations as belonging to the observed peer.

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[2] However, I agree that apes' ability in those tests is related to "affective empathy" (Lurz *et al*. 2022). Or, in my words –Bejarano 2022–, 'vicarious expectations' are related to 'spontaneous altruism'.

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These would be expectations of a special –vicarious– kind. But what exactly does a vicarious expectation consist of?

3.1. Expectations in General

Let us begin by attending to expectations in general. These, mainly since Bar 2007, are more often called 'predictions' (Latin *prae-dictio*: said or evoked in advance), a term that I don't like to use for non-human animals because of the view presented on the next lines. I borrow 'innate or learned expectations' from Lorenz 1966.[3]

General expectations, mainly the goals, are a vital resource to guide behavior and –as 'teaching mechanisms'– also learning in any animal. The matter is how expectations act in radically prelinguistic minds (and possibly also in our most spontaneous mental processes), while expected things are absent. Probably, instead of proposing that the animal agent has a mental representation (/simulation / evocation / off-line copy) of expected 'things/events', it could be helpful to understand such 'presence of absent elements' in a less demanding mode.[4] Therefore, we could describe them as well-defined but *empty* profiles hierarchically arranged according to its lesser or greater degree of dependency on learning. These empty profiles can recognize the appropriate content when it arrives.

Numerous scholars –e.g. Okasha 2022– claims that 'the mental representations of goal' in avian and mammal species are objective facts, and he justifies such claim "on grounds of (their) evolutionary continuity and neuro-physiological similarity (with humans)". But I, doubting that those "grounds" are enough of a guarantee, suggest the following alternative. It was the very beginning of the new lifestyle –that is, the initial strong increasing of cooperation and communication– that made more and more advantageous the full representation of goals: Individuals needed to communicate their displaced goals to their group, so that the group can cooperate towards reaching that goal.[5] Such need for producing and understanding such communications could progressively make evocation of the goal easier. In short, 'well-defined, empty profiles', which had been sufficient in the old lifestyle, no longer were.

But all this view is opposed to Fodor's (1978) 'language-of-thought' or 'innate mentalese'. Therefore, now I must focus on the contrast between this and my underlining of the crucial role of communication. In this way, I am close to the goal pursued, for example, by Fedorenko et al. 2024 – but not to their way of dealing with the relationship between language and thought. (The next sub-subsection offers some proposals about language, its origin and cognitive consequences. However, it is only later when I will propose what I call 'the new –even prelinguistic– communicative reception', which is the point where apes' Theory-of-Mind had to be transformed.)

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[3] So, the methodological, more particular matter of the violation-of-expectation paradigm (see the general review by Margoni et al. 2023) will not be discussed here.

[4] Nowadays it is known, at least, that predictions (or 'expectations') and prediction-errors (linked to perceptual input) are represented differently in animal (and human: Thomas et al. 2024) brains, and also that both types of mental states interact to shape our perceptual experiences.

[5] Such communications would already use non-innate resources (based not only in iconicity, but also, or even more, in past conditioned associations known by the group: Cartmill et al. 2024). However, it is very probable that these cultural gestures or calls lacked '*super*-high fidelity' transmission (which supports articulatory-phonetic imitation). In addition, let's note that in the reception of these messages, the principle "Teleology, first" in Theory-of-Mind (Perner et al. 2018) was, of course, obeyed. We could even suppose that such type of individual message attempted, firstly, to become more and more choral to, finally, influence group behavior: In other words, it would not be 'dialogic'. However, despite being far from even prelinguistic human communication, such messages would go beyond empty expectations of goals.

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3.1.1. Does the 'Language of Thought' Exist?

Fodor 1975 postulated that an innate 'language of thought' (discrete symbols, and syntax) supports perceptions (even if "these, unlike discursive representations, lack no canonical decomposition", as Fodor 2007 adds) and makes evocations possible. Certainly, this idea constituted a root of artificial intelligence, and this fact explains its current revival. However, I lean towards rejecting the existence of the innate 'language of thought'. More concretely, in some works, I have opposed, not only to innate syntax, but also to innate semantics, since our semantics is indelibly shaped by syntax: See Bejarano 2008, 2010, and 2011 (chapters 10-16). Without syntax, there aren't nouns / verbs / adjectives, etc.: There are not even nouns –my proposal insists against a deep-rooted idea that influences Hurford 2007, for example.[6]

Fodor's theory, although not focusing on the origin of human cognition and language, closely channels the hypotheses about such origin. Therefore, facing that theory requires facing its great potential for derivations. And hence this section is going to be longer than what one might think at first glance is appropriate.

Phillips 2024, trying to explain language-of-thought, proposes that "(perceptual) data are projected onto a base (conceptual) space in one direction, and in the opposite direction, these data are referenced by that space". I agree, of course, that the elements (objects, qualities, relations) of a perception are recognized by the individual who perceives. However, in my view, no *independent* element is used in genuinely prelinguistic perceptions. That is, while in linguistic understanding, each of the meanings receives independent attention before they are integrated into the total meaning, in those perceptions, on the contrary, such attentional, non-subpersonal independence of each relevant element would consume time, and therefore, far from solving any problem, would be a detrimental feature. (Certainly, we, using other human abilities, can attend slowly and long to any perception –let alone an artistic painting. However, perception evolved for survival in a world where rapid response is crucial.[7]) In addition, I think that in preverbal human infants (Cesana-Arlotti et al. 2018) and in animals, the so-called 'logical reasoning' requires neither decomposition nor compositional explicitation. Or if (as Durdevic & Call 2023 propose) "deductive reasoning, rather than relational or belief reasoning, is so far the best candidate for a human-unique derived cognitive ability", it is because deductive reasoning requires syntax and syntactic semantics.

But if I reject, not only the innate language-of-thought, but also its innate 'semantics', then I must try to give an alternative account of the emergence of language. Before that emergence, there were –I propose– pre-syntactic (that is, holophrastic) 'requests *for a certain material'* or 'calls *to a certain individual'*, which would use pre-words, i.e. meanings always linked to conative function and conative intonation. These holophrases could sometimes (when the individual was absent or the material was gone) reveal the speaker's false or outdated beliefs to the listener, and, therefore, provoke the theme/rheme composition, which corrects, completes or updates those beliefs (and is 'meta-communicative' in the minimal meaning of Dingemanse & Enfield 2023).

The emergence of this pre-grammatical syntax would have been helped by a new and broader intonatory pattern that girds into a single unit the theme and the rheme.[8] Such intonatory help –a

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[6] "The first words ever spoken is a key issue for the research in evolution of language" (Gasparri 2023). I agree with the importance of such issue.

[7] Planer 2019, a defender of 'languages-of-thought', understands perfectly that "if the brains of many animals instantiate languages of thought, then we face a serious explanatory challenge. That challenge is to explain how languages-of-thought might have evolved." But I am not persuaded by his explanation.

[8] This suggestion fits well with the link –Tomasello et al. 2022– between intonation and semantics: "Regarding prosodic cues that correlate with distinct communicative function, the brain responds very rapidly, but not in communicative situations without semantic content". Or, more precisely, without a semantic content either produced simultaneously with the prosodic cue, or immediately previous in a dialogue

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case of physical, pre-symbolic embodiment in human communication– probably facilitated the victory of voice over gesture –Bejarano 2014– (an evident victory, even if gestures continue to accompany and complement vocal communication).[9] Thus, a complex management of the two different levels of packaging (the word-level and the intonatory level) became necessary. It is worth focusing on that.

Linguistic structure, including hierarchical structure, is "a special case of structured action" (e.g., Planer 2023). In addition, Gallardo et al. 2023 propose: "In Broca's area, an action-related region evolved into a bipartite system, with a posterior portion supporting action and an anterior portion supporting syntactic processes". Could we then suggest that the structured action *immediately and directly* linked to syntactic structure is the action of managing the two different levels of packaging? Let's note that Osiurak et al. 2021 assign the "technical" dimension (not the "motor" one) of actions to Broca's area. This hypothesis is also consistent with the theory that recursive skills go beyond language (Corballis 2011) and explain the evolution of several human processes.

The new and broader intonation that girds into a single unit the theme and the rheme resulted in a duality of different sounds for the same sign (with the conative intonation in holophrases, and with the non-conative one in the genuine word used in pre-grammatical syntax). With this perhaps the problem arose of how to identify the same meaning in two different vocal patterns. The final solution could be the learning of articulatory-phonetic *sequences*, which are able to be produced with one intonation or another depending on the circumstances.[10] In this way the '*super-high* fidelity

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–I add. This second type can be produced with a minimal articulation originally empty of meaning (e.g., the 'huh?' of Dingemanse et al. 2013).

[9] "In human infants, shoulder movements, controlled by ipsilateral motor pathways from the right hemisphere, precede the left-hemisphere control of the right hand" –Rönnqvist 2003–, and also of culturally learned motor sequences. Nowadays it is also known that in humans, certain muscles that are mainly associated with shoulder movement –and, therefore, also with the expressive gestures that involve arm-movement– are likely to interact with the voice (Pouw et al. preprint). Thus, the superiority of arm-gestures over vocal resources that is observed in intentionally addressed communications of non-human primates –that indisputable (even if relative –Lameira et al. 2024) superiority– could perhaps be conserved in multimodal communication of human infants as the *anteriority* of arm-gestures –less complex than hand-movements– over cultural vocal learning. If that were so, then we could suspect that such anteriority, interacting with the voice, caused the new, broader intonatory unit, and, in this way, paradoxically ended up giving rise to the mentioned 'victory of voice on gestural communication'. We must take into account that "in apes, communicative gestures, unlike manipulative movements, are controlled by areas that in human brain are responsible for human language": Becker et al. 2021a, Becker et al. 2021b, and Meguerditchian et al. 2011. In short, I wonder if the following similarity has a basis in the ontogenesis and phylogenesis of our brain: Culturally learned movements of the right hand (controlled, of course, by left hemisphere) are embedded in a previous, simpler arm-movement (right hemisphere), and, similarly, culturally learned vocal signifiers (left hemisphere) are embedded in an intonational pattern (perhaps right hemisphere: Gainotti 2024 again vindicates the recently challenged "graded, right-hemisphere dominance for emotions").

[10] This learning, even if it does not have to face the problem of perceptual-motor correspondence –one hears oneself–, is a very difficult type of imitation. Certainly, as Heyes 2021a says, "I could copy a sound you make by simple trial-and-error, varying my vocal output until it matches my memory of the sounds you made". This perfectly describes the babbling. However, note that a unitary articulatory-phonetic sequence of several different steps neither can be vocally imitated simultaneously with its hearing nor can be easily remembered –at least not in a precise way.

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copying' could perhaps arise.[11] Obviously, "this type of imitation makes sense in intransitive or object-free actions" –Heyes 2021a. It is a "mimicking" –Tomasello 1999– of 'conventional' motor sequences. Regarding the 'high-fidelity copying', I agree that it was not necessary in the earliest technologies (see Andersson & Tennie 2023; Osiurak et al. 2022; Sterelny 2023; Tennie et al. 2012). However, if, as I have just suggested, the strictest motor imitation (i.e., the *super-high* fidelity in articulatory-phonetic sequential imitation) was really essential for the deployment of syntactic language (and, therefore, also of 'collaborative computation', Dor 2023), then such imitation is a very important cause of the human cultural advances.

Regarding a deeper link between language and those advances, I suggest that the predicative, really compositional language –beyond making communication easier– is likely to strengthen complex, non-serendipitous innovations, since these may be supported by the same cognitive resources (of decomposition and recomposition) used in syntactic language. Note that the primary cause of cultural advancement is not the ability to know-how copying (see van Leeuwen et al. 2024[12]), but the ability to produce innovative solutions, mainly through creative problem-solving (although more serendipitous processes, e.g. of drift from copying error, can sometimes lead to improvement of previous results).

I have no intention of turning into a proposal the previous suggestion that 'syntactic language, or, more precisely, its cognitive resources of decomposition and recomposition, help to support creative –even in non-linguistic areas– innovations'. Anyway, I'll bring some quotes. "Members of modern Homo sapiens can mentally combine and recombine symbols, according to rules, not only to consciously describe the world as it is, but to generate new visions of it as it might be" (Tattersall 2023, who, in my view, excellently describes *the consequences* of syntactic language). Vyshedskiy 2022 highlights the same issue, namely, 'the voluntary imagination component of language'. This imagination must –I would add– be used even in simple receptions of theme / rheme, since, for the typical, i.e. non-informed addressee (*versus* the atypical, perfectly informed one), the content provided by the theme doesn't include yet the rheme, and thus, the addressee will have to imagine a new situation that he/she has not perceived. A clear example: the reception of "The blanket turned to ashes". In addition, note that, in this reception, the real blanket (or, more exactly, 'the blanket for the speaker') is decomposed in two elements –firstly, 'the addressee's false belief about the blanket', that is, an inadequate means to reach the producer's communicative goal, and secondly, 'the adequate correction or updating'–, and thus, is communicatively recomposed. This is an *ability to transform* others' mental contents. Returning to the previous suggestion: Could that ability later –and more creatively– be exercised on one's own mental contents and support difficult problem-solving? Thus, in addition to connecting –in my nuclear proposal– human Theory-of-Mind with human communication, I also suggest to connect it with creative problem-solving in general (rather than only "with human causal cognition", which Gärdenfors & Lombard 2020 propose to connect with technology).

But let us return to our thread. What have I achieved in this section? Having said above that the innate *mentalese* is incompatible with my proposals, I unfortunately have not offered any strong argument against it. However, I have tried to show that an alternative hypothesis may also have

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[11] So, I am wondering about the possibility that the early language did not depend on the '*super-high* fidelity copying'. (This is a puzzle that Planer et al. 2023 focus on, although they solve it in a different way than I do.) Note, please, that the delay in the appearance of articulatory-phonetic sequences is a reliable fact in the first manifestations of writing. Could the same thing have happened in oral language? This suggestion, already put forward by Hockett 1960, has been defended by Fleming 2017, but in the context of studying the 'clicks' of South African languages.

[12] That article shows that chimpanzees used '*know-how* social learning' (from a chimpanzee that experimenters had taught) to acquire a skill they fail to innovate. Thus, we can think that if wild chimpanzees use such type of learning only very infrequently, it is because they don't produce complex innovations.

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potential for derivations. So, *if* it is accepted that the innate language-of-thought is not necessary, *then* expectations can be more easily described as empty profiles.

3.2. Vicarious Expectations

3.2.1. Can the Metaphorical Description Also Apply to Vicarious Expectations?

So far, we have dealt with expectation in general, which is inseparable from any animal life, and involves extremely basic competences (for instance, the physical understanding of the effects of gravity, or the daily exposure to the principles of causality). But what is interesting for us –what can, in my view, connect with apes' Theory-of-Mind– is only the vicarious expectation. Thus, we must focus on the following question: Can the metaphorical description ('well-defined but empty profile') also be applied to vicarious expectations? Such application seems plausible. Note, for example, that such emptiness can explain why 'level II perspective-taking' is absent in the primitive Theory-of-Mind.[13] (Rakoczy 2022 underlines in his general review this absence. See also even Woo & Spelke, preprint.)

3.2.2. An Argument That Favors That Application: Primates' Mirror-Neurons

To favor that affirmative answer, I will try to show that vicarious expectations derive quite directly from a particular non-vicarious expectation. Let us focus on macaques' 'mirroring', and, more concretely, on its origin according to Keysers & Perrett 2004. Hands are (together with the forearm) perfectly visible to their possessor, which must look at them very attentively during the actions of grasping. Thus, the proprioceptive and tactile feedback of any grasping will end up being connected with the visual perception of that movement.[14] There are growing indications that such proposal is correct. Heyes & Catmur 2022 conclude that the abilities of mirror-neurons are learned "through correlated experience of seeing and doing the same actions in the context of self-observation".[15] In addition, the alleged neonatal motor imitation, which tried to enhance the innatism of mirroring, is increasingly challenged (Oostenbroek et al. 2016, and Essler et al. 2023).

If Keysers & Perrett (2004) are correct, then we could underline that, while visual / proprioceptive connection is forming in a macaque, it is still a non-vicarious expectation: It is the macaque's immediate grasping that activates in him the (general, non-vicarious) expectation of the two versions –visual and inner– of the adequate 'feedback'. But, when the visual version is given without the corresponding inner sensations –that is, when it is someone else's hand–, the subject must disengage from himself the hand that is in sight. (Could this fit with the neuroscientific findings of Pomper et al. 2023?) Such disengagement is confirmed by the results of all the rubber-hand experiments: See e.g. Pfister *et al*. 2021: "A single tactile stimulus applied to the rubber hand –but not

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[13] Certainly, recent research –Steven *et al*. 2022– points to perspective-taking as a flexible and context-specific suite of abilities. However, here we can continue with Flavell's dichotomy.

[14] If this (in my view, very attractive) hypothesis turns out correct, then we could deduce that the so-called 'audio-motor mirror-neurons of birds' cannot be mirror-neurons. Note that, while learning the song-dialect, the bird does not sing yet. Therefore, the externally perceived dialect (that is, the dialectal enrichment of the innate template) is stored without any connection with proprioceptive expectations. Thus, if the proposal of Keysers & Perrett is accepted, the research about 'the mirroring' would have to refocus on primates, without it meaning undervaluing any type of 'analogous similarities' (underlined, for instance, by De Waal & Ferrari 2010).

[15] However, in other works on imitation and culture, Heyes –2021b, e.g.– rather emphasises that cultural practices –"childrearing practices that encourage adults to imitate infants and children, or the use of optical mirrors"– solve the problem of visuo-motor correspondence.

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to the real hand– triggers substantial and immediate disembodiment". But this 'disembodiment' (or exclusion from one' own body) does not only concerns the hand at sight, but also the proprioceptive and tactile expectations which the observation would have activated in the subject, and which this subject now needs to process as 'belonging to other'. This is when vicarious expectations and the very beginning of the primitive Theory-of-Mind would arise. In short, while it is typically emphasized that "mirror-neurons map other-related information onto self-related brain structures" (Bonini *et al*. 2022), I underline the later, inverse mapping (my own failed proprioceptive expectations become vicarious expectations automatically processed as belonging to another).

Certainly, the vicarious expectations that I propose to attribute to apes concern the entire body, not only the hand. However, this could be an irrelevant difference. Piaget 1945 showed that it is from hands and (since hands bring food to mouth) also from mouth that the child builds correspondences between his own body and other bodies. In addition, Errante et al. 2023 have found (in human participants) that "actions-observation activates specific cortical and subcortical sectors not only during hand actions observation but also during the observation of mouth and foot actions". In this way, if the hypotheses seen in this sub-subsection turn out to be correct, then we could deduce the desired conclusion –i.e., vicarious expectations are directly derived from non-vicarious expectations, and, therefore, if it is accepted that this latter type is an empty profile, then the same has to be accepted with respect to vicarious expectations.

What do I finally get from all this? If vicarious expectations –instead of requiring imagined (/simulated /evoked /off-line) contents– are 'well-defined but empty states', then no meta-representational separation between contents and vicarious expectations is necessary, and also then, the contrast between vicarious expectations and foreign contents can support the contrast between apes' and humans' ToM. But here we must add some clarifications.

3.2.3. Some Clarifications on Vicarious Expectations

After my criticisms to Tomasello and Southgate, I proposed that it is 'the subject's own expectation that is *absent*' when the subject activates vicarious expectations and encodes them as 'belonging to other'. Why do I use "absent" (*versus* "disregarded", the term applied by Tomasello to 'the subject's own knowledge')? Let's remember that behavioral activity necessarily activates expectations of goals and sub-goals. Therefore, "inattention to one's own expectations" can only take place when the subject, being behaviorally inactive, has not any general expectation activated.[16] Thus, the confusion is impossible, not only between (empty) vicarious expectations and one's own (full) mental contents, but also between both types of the subject's expectations –(absent) general expectations and (present) vicarious expectations.

I add another clarification. The so-called 'attribution of ignorance' in the primitive Theory-of-Mind does not require any resource different from vicarious expectation. The mere 'absence of vicarious expectations' –when, for example, the other chimpanzee has not seen the food– can explain why in that case the (subordinate) subject goes (Tomasello, Call & Hare 2003) to food. This view is close to Barone et al. 2022, who studied early implicit measures of false belief understanding: "The results from a new 'Ignorance' control condition in which children largely behave like in the 'False-Belief' condition, suggest that the epistemic state ascription does not amount to full-fledged belief attribution. Rather, children probably merely track knowledge *versus* ignorance". In addition, basic and implicit ToM capacities seem not to be the same ones as those tapped in standard explicit FB

[16] So the activation of spontaneous altruism mainly depends on the subject's previous state —or, more concretely, on his / its "spectatorial, non-active attitude"— and not on the state of the other individual. This is, of course, a strong limitation of spontaneous altruism.

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tasks, since –as Poulin-Dubois et al. 2023 found– there is no stability in Theory-of-Mind skills from infancy to early childhood.[17]

The most important of these clarifications is perhaps the following: If vicarious expectations are accepted, then we must accept that the self-other distinction is automatic in the primitive Theory-of-Mind. Let's see Ereira et al. 2018, who worked with human adult subjects: "When another agent's mental state is inferred, it can be identified as 'belonging to other' in two different ways." A way is that "a learning signal (prediction-error or belief) is encoded in an agent-independent pattern. In this case, the learning signal and the identity of the agent to whom the signal is attributed would need to be encoded in 2 separate activity patterns." This first way, with its meta-representational separation, would be linked to the advanced Theory-of-Mind (in Ereira et al.'s words, "to standard false belief task"). But these authors claim that, to identify mental states as 'belonging to other', there is another way, which operates "through an encoding of *agent identity intrinsic* to fundamental learning signals (my emphasis)". This second way of self-other distinction (which in human adults is limited to the most spontaneous processes[18]) would be, in my view, based on vicarious expectations.[19]

Vicarious expectations can include what Michael & Székely 2019 call 'goal slippage'. The '*slippage*' into the circumstances of the other, or the *'disembodiment' of expectations* (i.e., the 'exclusion from one's own body', Pfister et al. 2021) which the subject performs when the observed hand is a foreign one, or, as in Ereira et al. 2018, '*the encoding of agent identity intrinsic'* to the mental state –all these terms– describe 'vicarious expectations'. I would now add that such easy slippage is abruptly interrupted (both in humans and in apes) as soon as the other agent turns around and looks at the subject. We have to not forget that, in a subject, vicarious expectations are incompatible, not only with behavior, but also with high probability of immediate behavioral activation.

That rupture of the easy slippage is similar to what happens when, after having imitated (copying all his turns left or right) someone who walks ahead of me, I realize that he turns around and faces me. Certainly, humans can continue such bilaterally accurate motor imitation, but only if they start doing something different from what they were doing before (i.e., different from the mere 'slippage' into another location). More precisely,

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[17] From Neuroscience, Schüler et al. preprint say: "While the primitive Theory-of-Mind is supported by the salience network, it is the default network that supports foreign false beliefs and, more in general, the processing of internal, perceptually decoupled representations". Therefore, the activation of the advanced Theory-of-Mind must prevent all those representations from influencing our behavior. Obviously, such prevention –I add– is a much more difficult task than the one required in nightmares e.g. While in this latter case, there is only one line of mental contents –nightmare situations–, in the first one, however, there are 'two lines' of contents.

[18] Thornton & Tamir 2024 too can perhaps support that vicarious expectations (and primitive Theory-of-Mind) are also activated in adult humans.

[19] Those two ways might be relevant to solve a repeatedly alleged conundrum ("the empathy-sharing conundrum, which mainly refers to the self-other differentiation that empathy entails", Vincini 2023). In my view, the type of self-other distinction that is based on vicarious expectations does not involve any clash between self and other. This is the type that, when it is linked to 'empathy', intervenes in spontaneous altruism. On the contrary, the other type, when it is linked to 'empathy', appears, for example, when the subject receives a request that he/she feels as an obstacle to –or, in other words, as a clash with– his/her own activated goals. (Bejarano 2022 focuses on the second type –'the most demanding moral capacity'– and proposes that, while the estimation –or, ultimately, perception– of foreign mental contents is an adaptively very advantageous resource in human lifestyle, it however caused that the two typical features of perceptions —one, that of informing about the surroundings, i.e., of being true, and the other, that of being useful to the subject's interests— became, for the first time in evolution, dissociated from each other.)

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if I want to continue the imitation, I will have to *imagine myself in a situation which is as intrinsically impossible for me as being in a different spatial relationship with myself.*[20] (Let's think of the gesture of two individuals of shaking the other person's right hand*:* Could this gesture originally involve –or try to provoke– the grasping of foreign mental contents?) All in all, the similarity of the collapse of the flowing "slippage" in the two mentioned cases –with imitation and without imitation– is clear.

4. Primitive and Advanced Theory-Of-Mind

4.1. Working-Memory and Non-Verbal Tests Of False Belief

Indeed, in the (so-called) 'non-verbal tests of false belief' there are successes (significantly above chance), but they are quantitatively limited. Regarding non-human primates, see, for example, Berke *et al*. (preprint). In addition, 'replication findings' are mixed. This is why "a large-scale multi-lab collaboration will examine whether 18-27-month-olds and adults' anticipatory looks distinguish between knowledgeable and ignorant agents" (Schuwerk et al., work in progress). About those difficulties to replicate successes, Rakoczy 2022 proposes: "There might be two classes of implicit tasks".

How could we interpret all this? Certainly, regarding this matter, we must wait for new data. In addition –since "infants' experience is already enlanguaged" (Dreon 2023)–, the evolutionary emergence and the ontogenetic development cannot be identified. However, when we are asking a question so difficult to answer –when we are wondering about the evolutionary origin of human Theory-of-Mind– we should not rule out anything that can provide us even a little bit of light. Thus, I will add some little commentaries.

In my view, those non-verbal tests require –regarding just Theory-of-Mind– vicarious expectations, and do not need meta-representation of foreign contents. In other words, –regarding just Theory-of-Mind, I repeat– such tests mainly depend on the primitive, easier one (even though sometimes, of course, adult humans apply to them the advanced Theory-of-Mind). However, they require other abilities beyond Theory-of-Mind. Thus, the two scenes (original location, changed location) and the consequent demand on attention and working-memory can often provoke a great difficulty in less motivated subjects.[21] Such difficulty mainly appears if these are at the same time prelinguistic subjects. Note, please, that developmentally –and, very plausibly, also evolutionarily– the reception of multiple-word messages causes a great expansion of working-memory.

Leaving all this, let's focus on the only nuclear proposal in this article. Certainly, all the other proposals or suggestions offered in the article can and should be evaluated in themselves. However, if I have included them here it has been to hold the main one.

4.2. What Made The Estimation Of Foreign Mental Contents Originally Advantageous?

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[20] Corballis 2000 and Corballis 2001 claimed that we interpret the 'images in the mirror' as the *left-right reversal* of the original objects, and that, while a reflection's reversal is a product of optics, "*such interpretation comes from neuroscience*". This link with neuroscience could be lengthened: The sudden acknowledgement of standing before a mirror –and not before a peer– inhibits the mentioned high-level resource.

[21] Lewis & Krupenye 2022, for example, underline apes' competitive motivation. About infants' motivation, see an interesting proposal in Woo & Spelke 2022, who apply to this recent question (infants' estimation of others' false belief) an idea relatively similar to the link between "look for cheaters" and reasoning (Cheng & Holyoak 1985 or Cosmides 1989). In short, Woo *et al*. 2022 underline that, since in some contexts "the estimation of others' false beliefs may facilitate the ability to morally evaluate others' actions", such estimation is an adaptive task even in toddlers.

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My proposal up to this point has been that the contrast 'primitive *versus* advanced Theory-of-Mind' equals the contrast '(empty, easier) vicarious expectations *versus* (full, more difficult) foreign contents'. Therefore, the following question arises: What made the estimation of foreign mental contents originally advantageous? As the reader can see, I believe that only if we explain the difference –not only the difference in features but also in function– between vicarious expectations and foreign mental contents can we move forward.

I propose the following three points. First, to support the adaptive advantages provided by apes' Theory-of-Mind, vicarious expectations are sufficient resources. Second, since vicarious and non-vicarious expectations require previous, well-defined profiles in the subject that activates them, this subject cannot activate any vicarious expectation of mental states that are impossible for him in any circumstances.[22] Third, *your mental state of thinking of me as a foreign, distal individual, since it is a mental state that is impossible for me, cannot be a vicarious expectation of mine*, and therefore, I will only access that state if I am able to estimate foreign contents. Above it was proposed that 'the situation of being in a different spatial relationship with myself' is impossible for me. Now, a new example –your state of interacting with me as with a foreign, distal individual– would be equally impossible for me, but much more relevant for human needs.

Thus, we can reformulate our previous question in the following way. For what function was *'the ability of estimating the foreign mental states that involve me as a distal, foreign individual'* originally advantageous? Or, more concretely: In the new lifestyle, were there problems that such ability could solve?

5. Self-Conscious Emotions

I am now going to separate (as other researchers have done) Theory-of-Mind from 'false belief' a bit, and to focus more on those emotions and other issues. "A developmental approach that focuses on a plurality of domains makes us able to generate useful insights that may not be obvious when focusing on a single domain" (Ruba et al. 2022). Or, in other words, a puzzle is more difficult if some pieces are missing. But let's go back to work step by step.

"The thinking what others think *of us*" (Darwin 1872 about blush; my emphasis) necessarily requires, according to my proposal, the estimation of foreign mental *contents*, and therefore, the beginning of the advanced Theory-of-Mind. That phrase can also describe self-conscious (or 'self-other-conscious': Reddy 2010) emotions, which are "embarrassment, shame, guilt, pride" (e.g. Lewis 2000).

Is there a common neurophysiologic signature for these four emotions? We can see Piretti *et al*. 2023. However, these authors unfortunately did not include pride –the only pleasant self-conscious emotion– in their study.

I am opting –it is already evident– for the idea that such emotions are originally based, not on an innate moral core, but on an interpersonal relationship. Thus, in self-conscious emotions (unlike in basic emotions[23]), the subject "thinks what others think *of him*". Beyond Darwin's phrase, Frith & Frith 2007 is essential: "The appropriate reception of deliberate social signals depends on the ability to take another person's point of view. This ability is critical to reputation management, as this depends on monitoring how our own actions are perceived by others".[24] Indeed, when we experience self-conscious emotions, the contents of the foreign mind become more real, more relevant

[22] Obviously, any mammal or bird has expectations about the behavior of animals that are vastly different from him. But those are general, non-vicarious expectations.

[23] Thus, it is not surprising that, for example, pride, when it is compared to joy, involves what Bornstein *et al*. 2023 call "a relatively more distant perspective".

[24] We could also remember Baader's anti-Cartesian formulation ("Cogitor, ergo sum"), even if Baader (1765-1841) interpreted it "more theologically than interpersonally" (Geldhof 2005).

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for us than any other reality in our surroundings. Cf. Peeters et al. 2023: "[O]bserver-memories are often associated with events where the memorizer experienced a high degree of self-awareness, such as during public speaking. This could be explained by appealing to the context of encoding, where the relatively intense emotions guide encoding towards an observer perspective."

In this Section, firstly, I will argue that self-conscious emotions relate to the new, human lifestyle. They are "survival circuits" (as LeDoux 2012 or LeDoux 2023 describe the function of any emotion), but survival circuits of a very special type that evolved linked to the human lifestyle. Secondly, I will propose that self-conscious emotions require the estimation of somebody else's mental contents.

5.1. Self-Conscious Emotions Are Useful In The Human Lifestyle

The new, human lifestyle is based on special cooperation and communication. Consequently, the care of one's own reputation, and therefore, also an enhancement of self-control became crucial: Leary 2004; Sznycer 2019. (All this did not replace "the old dynamics of social dominance, which are based on aggressive and submissive interactions" –Royo 2024–, but was added to them. Hence, prestige is associated with evolutionarily new nonverbal displays: Witkower et al. 2020.) In this way, Baumard *et al*. 2013, who focus on "competition to be chosen as a partner in cooperative ventures", practically identify the care of reputation with the habit of refraining from "blatantly selfish actions".[25] This refraining is certainly essential in the care of reputation. However, even in "cooperative ventures" other aspects are important –e.g., the reputation concerning good communicative abilities. In addition, beyond cooperative ventures, there are –see Crespi *et al*. 2022– other "arenas of runaway social selection" where reputation is equally crucial. We must also consider that when narrative language and thereafter the (negative or positive) gossip arose, the care of reputation became more intense.[26]

But let us pay attention to a different usefulness of self-conscious emotions. 'The new, human lifestyle' requires also the "deliberate practice" –Ericsson 2002; Rossano 2003– that is necessary to achieve any kind of cultural expertise. Here, a self-conscious emotion –pride– intervenes. Experts arouse admiration. (About the two types of admiration –for skill and for moral virtue–, see Algoe & Haidt 2009. About admiration –*versus* envy– for experts: Onu *et al*. 2016.) Therefore, experts experience the only pleasant self-conscious emotion –pride. See Sznycer & Cohen 2021, and Sznycer *et al*. 2017.[27] The search for those attractive rewards can support, at least in some of the admirers, prolonged, effortful acquisitions, not only of the admired level of expertise, but also of a better one. This role of pride could become even stronger in "collaborative computation, which is the foundation of our cumulative cultures" (Dor 2023).

In addition to providing motivation in that way, pride could influence in an indirect, but still effective way. Progress towards a goal > Higher 'self-efficacy' > More difficult goals are perceived as possible. And a goal that is perceived as both difficult and possible (that is, a goal in Vygotsky's zone

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[25] Baumard *et al*. really propose: "The best care of reputation (the most adaptively advantageous one, since the error of mistakenly assuming that no one is paying attention to a blatantly selfish action may compromise an agent's reputation) is the genuinely moral habit". This, of course, is also proposed by many other authors, for example, Boileau ("Pour paraître honnête homme, il faut l'être".) I shall not comment such proposal here, but see Bejarano 2022.

[26] This could relate to what, on a higher, later level, Di Francesco *et al*. 2021 say: "People's self-defining life stories have an intrinsically defensive nature; the description-narration of one's own inner life is organized on the basis of the fundamental need to construct and defend a self-image endowed with an at least minimal solidity."

[27] Pride originally arose interpersonally: The "hubristic, narcissist pride" that is mentioned by Tracy et al. 2024 would have been a late, intrapersonal derivation.

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of proximal development –Vygotsky & Cole 1978) can improve the subject's level. In other words, "there may be a positive relationship between difficulty and progress when self-efficacy is high", as Thorne et al. preprint will try to confirm.

Certainly, children at first are concerned with learning by observing their parents. However, from about age 8, they switch to copying the local expert instead.[28] This tendency is probably universal (Henrich & Broesch 2011). Model expertise, despite not influencing automatic imitation (Nevejans & Cracco 2022), can cause desire to acquire such expertise, and in that causality, "admiration is more decisive than prestige bias" (Chellappoo 2021). In addition, let us look at experimental results by Brinums et al. 2023: "Children that were asked to imagine succeeding in the test and to focus on what they will be feeling (Emotional Condition) practiced longer than those in the Non-emotional Condition." More in general, Shimoni et al. 2022 report that a strong link between delay of gratification and pride has been found among preschool-aged children, an age at which self-regulation abilities are still developing.

Thus, pride can, I propose, support the cultural advances. Pride is a reward that subjects get when they see the admiration with which they are looked at by the group –a reward that the subject, of course, will seek to obtain again. Certainly, there are other rewards for an outstanding skill. E.g., André et al. 2023 –who do not underline the causal role of pride, or, more concretely, of its pleasant nature– focus on "reputational and material benefits to the recognized artists". However, the pleasure that pride provides, being less deferred and more easily evocable than those benefits, could originally be the best resource to support the prolonged effort that an outstanding skill requires. Spurrett 2024 attends to this effort: "Regarding, for example, the learning of post-Acheulean shaped stone tools, we should be concerned to explain the hours of effort with little or no short-run return". About this, Castro & Toro 2004 and Castro et al. 2024 talk about a reward –parental positive evaluation–, and also Sterelny & Hiscock 2024 (in their reply to Spurrett) focus on children. However, such focus is useful only to support the basic acquisition of skills, not to sustain the attempt to surpass the previous level of the group.

Therefore, pride –I propose– could be an important cause of the innovations that gave rise to our cultural advances. (Mere serendipity, in my view, would have had only a small influence.) Thus, the two features of the new, human lifestyle described above (in Introduction) would be supported by self-conscious emotions. In other words, not only the negative self-conscious emotions are partially responsible for its 'social' feature (as it is generally admitted), but also the only pleasant self-conscious emotion has a strong influence on its 'cultural' feature.[29]

In short, self-conscious emotions support self-control, which is necessary in different aspects of the new lifestyle.[30] Certainly, self-control (see Bejarano 2022, section 4) will be bolstered later by

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[28] As said above (in 3.1.1), while none of the earliest technological abilities implied high-fidelity transmission, this type of transmission not only supported later technologies, but also what I called (in 3.1.1) the set of all '*super-high* fidelity copying' –a.k.a. 'mimicking'–, i.e., the articulatory-phonetic copying, and the learning of songs or dances. (Obviously, in these skillful tasks the conscious activity of memorizing and copying the model gives way, after multiple repetitions, to sub-consciously memorized actions, and this allows attention to be focused on a higher level.)

[29] The underlining of pride is also useful to prevent the concept of self-control from being incorrectly narrowed. Bermúdez *et al*. 2023: "Apathy is a normally overlooked kind of self-control problem. However, compared to negative self-control (i.e., self-control against temptations), which relies more on situational strategies, positive self-control requires more intrapsychic work to get motivation."

[30] 'Self-control' (Shilton *et al*. 2020)? Or 'self-domestication' (Benítez-Burraco & Nikolsky 2023, to choose a recent example)? I can only say that the connotations of the term 'self-domestication' (even if this is very different from 'submission' –the evolutionary precedent of shame, according to Maibom 2010) are less

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'speech directed to oneself' or, even later, by 'inner speech', and can be put at the service of any type of goal (even the goal of exercising what I call –see previous note 18– the most demanding moral capacity). Probably, those very special types of speech originally arose when the gossip (which "gives gossipers an evolutionary advantage", Pan et al. 2024) spread more and more. However, before 'speech directed to oneself', self-conscious emotions were crucial for the growth of self-control in humans.

5.2. Self-Conscious Emotions And The Estimation Of Foreign Contents: The Two Connections Between Both Traits

Now, let us move on to the link between self-conscious emotions and the ability of estimating foreign contents. I propose that if the human being can experience self-conscious emotions, it is because he is capable of imagining himself in a situation as impossible as seeing himself as a distal, foreign element. (An earlier, more embodied version of that imagining was offered in 3.2.3.) Thinking what others think *of oneself* requires the ability to estimate other people's mental contents: Vicarious expectations would have been useless there. This is the first one of the two mentioned connections.

Let's move on to the second connection. Having opted for the idea that originally such emotions were based on an interpersonal relationship, I suggest that, very likely, such interpersonal relationship originally occurred as a prelinguistic intentional communication, that is, as expressive 'gestures or vocalizations' accompanied by gazes. (I agree with, for example, Bohn et al. 2022 that the main link between the kinds of signals our human ancestors used and human language "is the interaction engine". More in general, I start from Tomasello's claim that human uniqueness is previous to language.[31]) Such prelinguistic intentional communications could have been 'gesture of disgust (/ surprise) + eye-contact with the addressee' caused unpleasant (/ pleasant) self-conscious emotions in the addressee. (I'm not proposing these examples, but just putting them here to facilitate the exposition.)

Such productions are "simultaneous multilevel communications" (see developmentalists Lipschits & Geva –2024–, who also underline the decisive role of the adult-receiver). More concretely, in such communications the intentional level would control and use the behavioral one and even the autonomic one, i.e., those movements or expressions that originally were not intentionally communicative. This transformative transition of the old level makes 'the dissociation between expression and intentional communication' "murky" (cf. Warren & Call 2022), or, more concretely, 'absent, in my view, from apes' *production'*.[32] The proposal that "in such communications the intentional level would control and use the behavioral one" (Lipschits & Geva) is similar to 'the recruitment view' about the origin of great ape gestures –"Great ape gestures recruit features of their existing behavioural repertoire for communicative purposes" (Graham et al. 2024).

Certainly, the prelinguistic intentionally communicative messages that caused self-conscious emotions in the addressee stand out due to their special importance (focused on in 5.1) for the development of the new, human lifestyle. However, as communicative *productions*, they are examples just like any other within apes' and infants' ability. Despite it, we need to underline such messages: Note that, while the above cited phrase of Darwin perfectly serves, with its "of us", to distinguish what vicarious expectations cannot do, it however ignores a basic question –how the human subject originally comes to think what others think of him– and therefore, it can't get us to *the human communicative reception, which is an essential root of human uniqueness*.

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suitable for a capacity that, "even when it takes us to meekness, means the strength and power to use one's energy" for one's previously chosen purposes: Roszak 2022. (This author, instead of "self-control", uses the traditionally moral term "fortitude". But I cannot adopt such a use, since in my view –Bejarano 2022–, self-control is not necessarily moral.)

[31] Could Bryant et al. preprint –"Our findings support a two-step evolutionary process, in which changes in prefrontal cortex organization emerge prior to changes in temporal areas"– reinforce that claim?

[32] Remember that, much later in development, also our current narrative speech uses 'theatricalization' in gestures and affective prosody. Likewise, 'symbolic play' –or 'pretense'– might train this 'intentional control and use' of behavioral and even 'autonomic' levels.

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So, henceforth this subsection will focus on that root, and in this way will give a second argument in favor of the link between self-conscious emotions and the estimation of foreign contents.

As I have just suggested, in non-human primates the intentional control of the behavioral and autonomic levels can occur in production. Thus, in the beginning, human communicative uniqueness primarily affects reception. In other words, according to my proposal, it is the recipient who *originally* needs to strive –and to estimate foreign mental contents.

This proposal (it is the recipient who originally needs to strive) maybe can seem like a way to escape from the controversy between, on the one hand, Heintz & Scott-Phillips 2022, who agree with Grice that "the communicative producer typically intends that the recipients recognize his/her communicative intention" and, on the other hand, Moore 2015 or Geurts 2019, who reply that it is only to hide his/her communicative intention that the producer must strive. However, in my view, that 'second Gricean requisite' is not the best terrain to focus on the very origin: Note that, while Grice starts from a clear contrast between natural and non-natural signs, I propose that it is the transformation of a 'natural' (or rather, returning to Lipschits & Geva 2024, merely "behavioral" or even "autonomic") sign into a 'non-natural' one –precisely such transformation– that must be recognized by the addressee.[33] This transformation is close to, by example, "the markedNN behavior" invoked by Mussavifard 2024, although at the prelinguistic origin its recognition was totally borne by the addressee without the help of linguistic cultural resources.

But let's get back to our thread. What I really propose is that, *if* an addressee identifies through vicarious expectations the outcome that is intended by the producer, *then* this addressee will not be able to perceive the producer's behavior as a communicative behavior towards him/her –i.e., towards the addressee. Therefore, the eye-contact that typically accompanies chimpanzees' intentional communications to an addressee will be, of course, understood by the ape-addressee as a communicative resource, but it will not be applied to the behavior that activates vicarious expectations. This non-unified reception is certainly more hazardous and less effective than human, unified reception. However, if, as I propose, the non-unified one exists, then it sometimes must produce the result wanted by the producer.

But my proposal can only be defended if we find *which is the condition which allows some intentional communications of that type to be successful* –i.e., allows that they get the addressee to satisfy the producer's desire. The proposal makes the following prediction: In such successes, the behavior with which the ape-producer tries to manipulate the addressee's attention toward evidence of the intended outcome –*that behavior*– *may be well understood even if it is not perceived as communicative*. If that were so, then we could hypothesize that failures do not derive mainly from a deficient ability for pragmatic interpretation (even if interpretation, "in a novel situation, requires the integration and assimilation of multiple pieces of information to guess at outcomes", Warren & Call 2022), but above all from the limitations of non-unified reception.

Melis & Rossano 2022 –as others had done before– claim that monkeys' and apes' communicative production is better than reception. These primates can intentionally produce messages to ask, or even show ("A female adult baboon tries to draw the attention of her offspring toward the piece of fruit that she waves between her fingers", Meguerditchian 2022).[34] However, when the non-human primate receives the message that is addressed to him, he cannot –I propose– grasp that 'such action of trying to draw attention' is simultaneously 'mental' and 'addressed to him, i.e, to the recipient'.

Returning to the purpose of finding which is the condition which allows some intentional communications of that type to be successful, I will start by recognizing that such task is a difficult one. Leavens et al. 2005, studying their captive but untrained chimpanzees, have found that ape-producers no longer use pointing gestures as soon as the recipients leave, and confirm, therefore, that those communications are intentionally targeted at the addressee, but nothing is said about reception, because the addressee is human. Contrarily, in Hobaiter et al. 2014, the addressee of the pointing gesture is the chimpanzee-producer's mother, but in the case observed, the mother did not satisfy the desire. (She probably did not as it would have been risky –we can suppose–, but, anyway, this case

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[33] Such recognition is so adaptive that 'the possibility of false positives' (i.e., the currently very mentioned 'overextension of Theory-of-Mind'–see, e.g., Bering 2011, chapter 3) doesn't matter.

[34] Likewise, human infants produce 'ostensive gestures with an object' months before making pointing gestures (Rodríguez et al. 2015 and Guevara et al. 2024).

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cannot be used as an example for successful communication.) Loud scratch, despite its great relevance, doesn't seem to help us enough either, since it has typically been regarded as ritualized. (However, in this case, we can remember, not only 'the recruitment view' –Graham et al. 2024–, but also a question that was raised above, in 3.2.2 –Is it the case that only the primates possess vicarious expectations? If it is so, then loud scratch could activate vicarious expectations instead of the general expectations that are activated by the overwhelming majority of animal ritual signals.)

Does all of this constitute an insurmountable obstacle? I believe it does not. We –again– must consider that, if those gestures or behaviors could never be understood by apes, then they would not be produced by wild (Hobaiter) and captive but non-trained (Leavens) chimpanzees either.

We can see that those productions occur when a very conspicuous obstacle (the cage in Leavens, or the dominating individual in Hobaiter) prevents the producer to satisfy his/her desire. Therefore, 'the behaviors that try to signal the purpose of the producer' can be understood by the ape-addressee as behavior which merely responds to the producer's desire (although, due to the obstacles, he, the producer, is unable to satisfy such desire). Or, describing it according to my proposal: Those behaviours raised vicarious expectations in the chimpanzee-addressee, and did not need to be understood as communicative by that addressee.

The non-unified reception may seem surprisingly inappropriate. However, it was –I suggest– kept in apes for two interrelated causes. Firstly, in apes' lifestyle, the non-unified reception, despite being suboptimal, is a sufficiently useful resource. Secondly, the change to unified reception requires a new ability and probably also brain modifications that allow the duality of contents.

A clarification can be here convenient about the *unified* reception of those human prelinguistic communications (i.e., the unification between 'gaze towards the addressee' and 'behavior that tries to signal the outcome that is intended by the producer'). While such reception already must be supported by the estimation of foreign mental contents (or, more concretely, of a foreign thought that starts to interact with the addressee subject), it is still different from the predicative language. Note that, on the one hand, only predicative communications are primarily used to correct (or complete or update) the addressee's beliefs. On the other hand, the role that the gaze towards the addressee fulfills in those human prelinguistic communications is dispensable in linguistic communication: The non-natural feature of linguistic signs is sufficient (as said above) to reveal that they have intentionally communicative function.

In humans, the non-unified reception is absent. The human addressee that possesses the advanced Theory-of-Mind, not only can activate vicarious expectations, but also estimate foreign mental contents. Let's apply this –if only to close the argument– to self-conscious emotions. I have accepted that, for communication to cause self-conscious emotions, the recipient must estimate the interiority of the producer –i.e., a foreign interiority which is communicating with him, the recipient, or thinking of him.[35] But if the recipient's ability to estimate foreign interiority is reduced to the activation of vicarious expectations, then, that ability –I propose– will not be able to apply to a foreign interiority which is at that very moment communicating with the recipient.

In conclusion, self-conscious emotions 1) support the 'cultural' and 'social' features of the new, human lifestyle, and 2) are linked to its most basic and crucial feature, which is the new, advanced type of communicative reception. In the Introduction (when I focused on the question, 'What is 'the new, human lifestyle'?), it was stressed that this lifestyle needed increasing communication. In addition, I mentioned this need in relation to the issue of "collaborative computation" (Dor 2023). But now we can say that prior to that quantitative increase, the new lifestyle needed a deep change of communicative reception.

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[35] Ontogenetically that estimation is a difficult process, even in its prerequisite: So, caregivers may naturally express their emotions in ways that maximize learning possibilities –e.g., "emotionese": see Benders 2013 or Ruba & Repacholi 2020.

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6. The Advanced Theory-Of-Mind Beyond Its Origin

'The thinking foreign mental states which involve us as their distal addressees' (i.e., the process that I have called 'the new communicative reception') is, in my view, a requirement only for the origin of the human Theory-of-Mind. In fact, I propose that, once the ability to think 'two lines' of contents becomes strong, the advanced Theory-of-Mind can carry complex functions which do not fulfill that requirement. Such complex functions are varied.

Sometimes they use foreign but non-interactive contents, as in verbal false-belief tests, which involve –I borrow Dor's (2016) words– "a non-dialogic capacity of mind-reading". Note that in those verbal tests, the communicative interaction, instead of being between the subject who attributes the mental content and the 'attributee', is reduced to that which is established between child and experimenter. Regarding this feature of verbal tests of false belief, Gallagher 2015 states that "given the specific attraction of the second-person interaction (*versus* third-person perspective), the saliency of the interaction with the experimenter takes precedence over the third-person task". Barone & Gomila 2020, elaborating that contrast, propose that second-person attributions of false belief (unlike third-person attributions –for example 'The Ancients believed that *p*') "are transparent, extensional, nonpropositional and implicit".

By way of a parenthetical digression, I will comment about first-person beliefs. Regarding *current* first-person beliefs, if it is required that they possess the meaning of 'believe' that habitually is activated in second- or third-person attributions ('He –mistakenly– believes that *p*' vs. 'he knows that *p*'), then we must say that originally, such first-person beliefs did not exist. Primarily, for human subjects, their non-outdated beliefs are just the reality (and –primarily, again– their outdated beliefs are immediately replaced in an automatic way by the new perceptions, and so, the origin of the predicative negation was not intrapersonal but interpersonal). In short, the 'believer' cannot have first-person beliefs in the above-described sense, but only 'knowledge': On this point I agree with Phillips et al. 2021 (at least, for a primitive, prelinguistic sense of 'knowledge' –as Rakoczy & Proft 2022 specify). The concept of belief (and of some traits of character: remember what Ross 1977 called 'fundamental attribution error') probably emerged in an interpersonal way. In my view, the called 'animal meta-cognition in great apes' (summarized in Tomasello 2022; see also Tomonaga et al. 2023) is not a judgment on one's own contents, but a mere hesitation about one's own general expectations, or (as Edwards-Lowe et al. preprint say) "subpersonal uncertainty estimates".[36]

Once the digression is over, let us return to "second-person (*versus* third-person) attributions". According to my proposal, this type of attributions is included within 'the advanced Theory-of-Mind'. However, I fully accept its great simplicity. As said above in 3.1, even pre-syntactic 'requests for a certain object' or 'calls to a certain individual' could reveal the speaker's false beliefs to the listener: Therefore, those easy, second-person attributions of mental contents could provoke the origin of syntax.

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[36] Thus, according to my proposal, the *intra*personal meta-cognition or *intra*personal 'cognitive humility' (i.e., a cognitive humility not primarily understood as "moral interpersonal virtue" à la Priest 2017, or "as reputation management" à la Karabegović & Mercier 2023) would be a very late human ability. I agree with Li 2023 that it is both interpersonally originated (since the subject during a dialogue sometimes grasps that the knowledge of the other is more complete than his) and very necessary. In addition, I suggest (see also the end of 3.1.1) that this cognitive humility is required by the transformation that any creative problem-solving involves, i.e., by the transformation of our initially inadequate resource to solve the problem. That type of humility –that, so to speak, 'culmination / intrapersonalisation' of Theory-of-Mind– is maybe enhanced by the least social –and ontogenetically the latest– type of laughter, namely the laughter caused (e.g., after a punchline) by one's own pleasant interpretive failure.

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Other times, non-original functions of the human Theory-of-Mind are not only non-dialogical. Indeed, they can use non-foreign contents. These contents are either the subject's beliefs which he no longer holds, or 'possible' contents, in any of the senses of 'possible'.

However, according to my proposal, the uniquely human Theory-of-Mind originally arose from a directly relational, interpersonal process, which requires neither language nor experience with narratives. In my view, the linguistic modeling of Theory-of-Mind –Heyes & Frith 2014; Moore 2020– is a much later step, which required new discoveries. Among these, it is worth highlighting above all the irreducibly hypotactic 'referred speech', and the verbs 'say', 'believe', or 'imagine'. (See Bejarano 2011, chapter 21.)[37] Thus, the original 'estimation of foreign mental contents' is what cognitive archeologists Foley & Mirazón 2020 recommend looking for, namely, a "component attribute" (*versus* 'compound concept').[38] Likewise, my proposal on the origin of human Theory-of-Mind fits with the suggestion that "a priority for future research is to identify the *genetic 'start-up kit'* for the cultural inheritance of mind-reading" (Uta Frith, cited with approval by Heyes & Frith 2014; my emphasis).

7. The Advanced Reception of Pointing

7.1. Pointing Gesture in Evolution Of Language

In children's acquisition of language, pointing gestures are important (Southgate et al. 2007; Kishimoto et al. 2007). Since the child's pointing gestures may often provoke linguistic comments from the adult about the signaled object, it is evident that those gestures create the ideal context for learning words. Note that, although the words that appear in the adult's comments may be unknown to the child, this will rely on the trick of knowing which object such comments refer to. (This is a later, much more effective resource to acquire knowledge than the frequent 'gaze-following with vicarious expectations', which is, of course, my reformulation of Southgate's 'altercentrism'.) But in evolutionary origin of language –I propose– pointing gestures may have been even more important.

This Section, even if now I will add new arguments and data, will repeat the same hypothesis above applied. In 5.2, I applied it to the reception of the communications that cause self-conscious emotions; now, to the reception of pointing gestures. However, I have considered it appropriate to delay in dealing with pointing gestures, since, while self-conscious emotions are almost unanimously considered uniquely human, regarding pointing gestures, however, things are very different.

In addition, at the end of this section I return to 'the hypothesis of the cooperative eye' (constructed by Tomasello after the study by Kobayashi & Kohshami of primates' eyes). Certainly, since my proposal will put the evolutionary transition precisely in the process that unifies the two gazes (i.e., that extends the communicative function of 'the gaze towards the addressee' to 'the gaze towards the object'), it fits well with the fact that human eyes make the horizontal travelling of the iris conspicuous. Likewise, such conspicuity is certainly an embodied resource, like that of the broad intonational pattern that was proposed above regarding the origin of syntax. However, I'm not totally convinced that the human type of eye emerged in relative synchronization with the beginning of the human Theory-of-Mind. In other words, while I am fully convinced that human eyes are very effective facilitators of the advanced, or 'unified', reception of pointing gestures, I have only a faint hope about that synchrony. Anyway, since the problem of when the transition occurred is so difficult, I strongly recommend that researchers in Paleogenomics try to answer the question of when the

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[37] 'Say' and its intensifiers 'promise' or 'swear' were later used in 'first person + present + affirmative', an apparently tautological use which came to fulfil a new function, but still related to 'referred speech'. With them the speaker communicates that he is aware of how his speech looks –and could be referred– from the outside. (I prefer this interpretation to the 'performative' one.)

[38] This basic attribute could be very variably manifested, particularly in its very beginning (the Middle Stone Age, which "exhibits a predominantly asynchronous presence and duration of many innovations across different regions of Africa" –Scerri & Will 2023 and see also above the note 1).

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human-type eye appeared in evolution. As said above, we should not rule out anything that involves any possibility of giving us light.[39]

7.1.1. Responding to a Ptosible Objection: Pointing In Apes

On the one hand, I have proposed that the advanced Theory-of-Mind is uniquely human. On the other hand, we know that many chimpanzees raised by humans have been taught to produce pointing gestures and to understand them (even the declarative type of pointing: Lyn et al. 2011). What answer can I give to all this?

I will begin by admitting two indisputable facts. One, "human children display this ability to use communicative cues only after many months of intensive exposure to cultural environments characterized by frequent referential signaling, both verbally and nonverbally" (Clark *et al*. 2019). Two, the absence of pointing is not at all harmful in "apes' lifestyle".

From those statements, some authors conclude that in non-human primates that ability would be present, although scarcely exercised or developed. See Vasilieva 2019: "Not only the presence / absence of a trait, but whether it manifests in animals to the same degree as in humans, is equally important for our understanding of trait evolution." Heintz & Scott-Phillips (2022) offer the following example: "Human bodies are not especially well-suited to swing from trees. However, there is no absolute barrier." In that same line, Berio & Moore 2023 recommend resuming great ape enculturation studies.

But, according to my proposal, it is only the effective, 'unified' reception of pointing gestures that is uniquely human. Certainly, in this way, I place as vital criterion a process which is still unobservable, which may seem like a withdrawal towards "untestability with scientific methods" (Leavens 2021). However, as it can be seen, the proposal relates to some facts and to several potential experiments and research.

7.1.2. Authors Who, When Dealing With Pwithing in Apes, Have Focused On Reception

The focus on reception is not new. Moore 2013 focuses on the receptive failure of apes and proposes that "since pointing gestures provide poor evidence for a speaker's message, they exceed the pragmatic capacity of apes". Likewise, Morrison 2020 emphasizes the ambiguity and necessary disambiguation of pointing gestures. I agree with these claims. But, in my view, those 'poor evidence for the message' and 'poor pragmatic ability' are insufficient to explain the frequency of receptive failures in apes.

Lyn & Christopher 2018 list three conditions in which the experimenter may point out and whose reception by apes is differently successful: "i) Proximal-Proximal: The choice items are close together and the point is close to the correct item. ii) Proximal-Distal: The choice items are close together, but the point is further away. iii) Distal-Distal: The choice items are further apart, and the point is therefore necessarily further away."

According to that work, in Proximal-Proximal and in Distal-Distal, point-following can be achieved by simple mechanisms. However, "in Proximal-Distal, the best predictor of success is ontogenetically previous human social contact". I would underline the fact that it is just in Proximal-Distal where the direction of head of the producer (that is, the cue that chimpanzees use to estimate what others can see: Tomasello *et al*. 2007) is unable to signal the object.

7.1.3. Unlearned Production in Apes

Before focusing on the contrast between the two receptions, it is convenient to go again and in a more detailed way over unlearned production in apes. Leavens *et al*., 2005: "Unlearned (i.e., with no explicit training whatsoever) captive chimpanzees frequently point to unreachable foods. These are

[39] In words of Uomini & Ruck 2018 (who exemplify this attitude in their study of the emergence of human handedness): "The paucity of data is an obstacle in studying cognitive evolution, but this has not stopped researchers from trying". I really love that "but".

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communicative signals because apes will not reach towards obviously unreachable food if there is nobody around to see them do it". In addition, in those chimpanzees a repeated gaze-alternation between the food and the experimenter was significantly associated with their pointing gestures.

Since then, Leavens and other authors began to ask themselves whether conditions like those (cage and benevolent recipient) which in the mentioned observations were considered as decisive appeared in wild chimpanzees too. Hobaiter *et al*., 2014 offer the following proposal: "Wild chimpanzees experience few physical barriers, but the presence of a dominant, unrelated chimpanzee monopolizing a particular resource may be a greater barrier to a young chimpanzee's access than bars on a cage. To overcome this challenge, a juvenile's only resource is another chimpanzee, mainly its mother." Thus, they found a case in the jungle which they classified as "possibly deictic". A possible conclusion: Wild chimpanzees that use this type of production with their conspecifics can thus achieve (at least sometimes) their goals.

Nevertheless, for such production to be a useful resource in the wild, it is necessary for recipients to deliver (at least sometimes) the desired object. Is it possible? Animal altruism is a controversial matter: see, e.g., Rendall *et al*. 2009 *versus* De Waal 2009. But I do not discard it, if it does not cross the limits of the (always narrow) 'spontaneous altruism'.[40]

7.1.4. Reception of Poiofing Gestures in Chimpanzees and in Humans

Regarding the reception of pointing gestures in chimpanzees, I begin by highlighting that they understand the communicative value of *gazes towards the addressee*. Indeed "the sensitivity to being watched is both innate and shared by most vertebrates" (Klein *et al*. 2009). Thus, in the species that can perform 'recipient-directed' communication, recipients of that gaze understand that they are the addressees of this innate communicative resource. (But, while in gorillas, eye-contact communicates mild threat, in chimpanzees, by contrast, it is a friendly communicative resource.)

However, in the chimpanzee-recipient such communicative value is not applied –this was proposed above in 5.2– to the other element produced by Leavens' or Hobaiter's untrained chimpanzees, that is, to the *gaze towards the object and hand/arm movements*. The 'gaze towards the object and hand/arm movements' is, for an ape-addressee, a non-communicative behavior that activates vicarious expectations in him (in the addressee). It is fair to specify up to which point this description of non-human reception of pointing gestures seems implausible to human intuition. The producer, both before and after making movements in a certain direction with his arm and head, communicates with the recipient by means of eye-contact. Why would the recipient not understand that the producer's movements are communicative, or, in other words, that the communicative value of eye-contact is applied to those movements and gives them a communicative function? For humans, that unification of the two consecutive instants is obliged and unstoppable, I acknowledge it. But is such unification present in chimpanzees?

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[40] About 'spontaneous altruism': See Tomasello 2012, Rand *et al*. 2012, and, especially, "self-other merging" (Miyazono & Inarimori 2021) and "goal slippage" (Michael & Székely 2019). (I also wonder: What about the unquestionable footprints of caring for the ill or the wounded that have been found in Neanderthals? At least we cannot doubt "the selective advantages of reducing the risk of mortality of other group members in groups whose members are highly interdependent", Spikins et al. 2019.) Spontaneous altruism is ontogenetically earlier than the motivation to improve one's own reputation by helping: See Hepach *et al*. 2022. About the (probably, very primitive) type of spontaneous altruism that, "connected to reactive, non-cognitive fear circuits, helps others under threat" (for instance, in social hunters): See Vieira *et al*., 2020, Vieira & Olsson, 2022. About the limits of 'spontaneous altruism', see previous notes 19 and, above all, 16.

As said above, the cage (Leavens et al. 2005) or the dominating individual (Hobaiter et al. 2014) *make the chimpanzee's gesture non-absurd for conspecifics even if it is not interpreted as communicative*. On the contrary, our human reception of pointing gestures can be considered closer to that of communicative pantomimes.[41] Tomasello 2008 stresses how strange any pantomime can be for a recipient if the gestures involved are not interpreted as being communicative ("the recipient will see my iconic gestures as some kind of strangely misplaced instrumental action"[42]), but he does not say it about our pointing. However, according to my proposal, in both cases a same problem arises for apes. On the one hand, in the reception of pantomime and of pointing gestures, the gesture or behavior (i.e., those movements with which the producer tries to manipulate the addressee's attention toward evidence of the intended outcome) must be –often at least– received as a communicative signal, but such movements cannot be understood in this way if they have activated in the recipient vicarious expectations; on the other hand, such expectations are, in the apes' Theory-of-Mind, the only resource for estimating foreign interiority.

Now, let's pay attention to the alternation between gaze to the object and gaze to the addressee. This alternation appears in apes' and humans' production of pointing gestures. In Leavens et al. 2005 we already read that in those captive but untrained chimpanzees the repeated gaze-alternation between the food and the experimenter was significantly associated with their pointing gestures. Even more important –of the utmost importance really: Paulus & Fikkert 2013 show that the necessary and sufficient element for human babies to first understand pointing gestures is not the hand-movement (or its situational / cultural variations: Cooperrider & Slotta, 2018), but the alternation between the two gazes. Thus, we must focus on it.

On the one hand, the 'gaze towards the object' causes the recipient to estimate what the producer sees. On the other hand, the 'gaze towards the recipient' (a.k.a. 'eye-contact') informs the recipient that he is being the addressee.[43] In addition, inter-brain consequences of eye-contact in humans are increasingly studied. Pan et al. 2020 mainly focus on teaching. Di Bernardi Luft et al. 2022 stress that "inter-brain synchronization mainly flows from leader to follower", and thus, from the producer of pointing gestures to the addressee. In general, second-person approaches underline eye-contact: Cañigueral et al. 2022.

But what must be highlighted is that in our human communicative reception, those two instants ('gaze towards the addressee' and 'gaze towards the object') cannot in any way remain separate, but they must be unified. The addressee has 1) to estimate what the producer from his place and in his circumstances is looking at, and 2) to understand that what the producer is looking for by looking at the object is to point at the object for him, for the addressee. According to my proposal, it is –as the reader already knows– in that unification where the problem arises for the ape-recipient. Let's return

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[41] According to Tomasello & Call 2019, "attention-getters, since they manipulate attention of addressees, evolutionarily precede pointing gestures, while intention-movements, since they manipulate the imagination, precede pantomimes". I agree with such difference, but my interest is now in the similarity of both receptions.

[42] See also Bohn et al. 2020, who show that apes do not learn from iconic gestures.

[43] When infants *first* understand pointing in a unified way, do they understand it only when the producer addresses it to them? Clark 1996 claimed: "The basic arena for social interaction is the dyad". Certainly some findings might seem to challenge that claim. (Thiele *et al*. (preprint) report that "observed joint attention" already modulates 9-month-old infants' object encoding. Likewise, according to Goupil *et al*. preprint, both humans and macaques show spontaneous preference to look at two bodies facing towards each other.) However they don't seem to me. Thus, I do not leave "the dyad": It is not only that we are primarily focusing on the evolutionary (vs. developmental) origin. Even more importantly, according to my nuclear proposal, the advanced Theory-of-Mind is originally dialogical.

one more time to 4.2. Certainly, vicarious expectations are automatically processed by the subject as belonging to the observed individual. However, since there can be no vicarious expectation of the results of an action intrinsically impossible for the subject, the recipient-subject will be unable to apply to such expectations an interpersonal communicative function towards himself.

Therefore, the unified, fully effective reception of pointing gestures will only be possible by the estimation of mental contents of the producer. Thus, there would be a common capacity to that reception and to that of prelinguistic messages that cause self-conscious emotions (and to linguistic reception[44]). That ability can be colloquially described as the one of 'remaining in your shoes when you look at me'.

A preliminary test about these proposals could investigate in humans whether there is some relevant neurophysiologic similarity between the interpersonal activation of all (negative and positive) self-conscious emotions and the unified communicative reception of pointing gestures. If such similarity is found in the future, then the plausibility of the general proposal would increase. But it is convenient to specify that the proposed explanations of self-conscious emotions and of the effective, unified reception of pointing might be evaluated by future discoveries differently each one of them.

In other words, in addition to total success and total failure, there are other two possibilities, the partial results. Thus, it might be discovered that, while the proposal about the advanced reception of pointing can be maintained, the explanation of self-conscious emotions must be transformed –for example, rejecting their interpersonal origin and deriving their ontogenetic and evolutionary emergence from 'an innate core' of moral norms. Or, conversely, the result might be that, while the proposal about self-conscious emotions can be maintained, the effective, non-hazardous reception of pointing does not require any process of unification between 'gaze towards the addressee' and 'gaze towards the object' –because, for example, their mere succession might be enough for full effectiveness to be achieved through "the human pragmatic competence, which is greater than that of apes" (Moore 2013), or, alteernatively, because human beings are much more inclined to gaze-following (an inclination that might derive from the salience of human eyes, or connect with the Natural Pedagogy account –Csibra & Gergely 2006). Anyway, for now, I bet on my proposal in the most ambitious way (or rather the most self-reinforcing one: To give a recent example, see 'causal-association inferences' in Currie et al. 2024), that is, applying it to both abilities.

Of course, in the beginning of 'the new lifestyle', several behaviors (not very different from the ones carried out by Leavens' and Hobaiter's untrained or wild chimpanzees) could achieve some degree of reception and could be useful for both producer and recipient. Let's consider, for instance, the action of pushing a conspecific until we place him so that he can see a relevant object. These types of communicative production would have been multiplied in the beginning of the 'new, cooperative lifestyle', without the recipient grasping the communicative function of the behavior yet. But this problem finally became accessible to co-evolution genes/culture. And so, the effective, unified *reception* of pointing gestures appeared, together with the estimation of foreign contents.[45] Now, I

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[44] Bejarano 2011, chapter 6: My argumentation started by focusing on the *reception* (also studied by Fernandez-Rubio 2021) of the most egocentric deictics (i.e., the words that do not allow echolalia), but it extended to *any linguistic reception*, *which always includes where the message comes from.*

[45] What about dogs? Eye-contact –i.e., the communicator making eye-contact with the dog– is the major cue that dogs use to determine when a human pointing is intended for them. (Kaminski *et al*. 2012; Téglas *et al*. 2012.) However, Lyn *et al*. 2024 have slightly lowered the initial triumphalism: Since dogs have more difficulty in following contralateral pointing, these authors suggest that ipsilateral points are learned through associative mechanisms. More in general, the Project MANYDOGS will try to replicate previous findings. In addition, already Zuberbuhler 2008 defended that "social carnivores must decide on one particular prey individual prior to group hunting". Thus, if the dominant wolf remains for a few moments looking at –or

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will propose that the unified reception of pointing gestures is strongly facilitated by a little anatomical feature.

7.2. The Human Eye and the Unified Reception of Pointing GestuRES

Kobayashi & Kohshima 2001 focused on the universally human white sclera, or, more precisely, on both its horizontal enlargement and its depigmentation, and proposed that these human peculiarities enhance "the visibility of eye-gaze orientation". But gaze-following –a phylogenetically old ability– is carried out without the help of the white-of-eye. Indeed, Tomasello *et al*. 2007 showed in apes the reliance on head (*versus* eyes) in gaze-following. Likewise, Chris Moore 2008 concluded from his experiments that when infants first start to follow gaze (at that age –note, please– they are still unable to receive pointing gestures), "they do so on the basis of head direction, not eye direction".

However, Tomasello et al. 2007, putting 'the enhancement of the visibility of eye-orientation' in the evolutionary context of human special cooperativeness, hypothesized that humans evolved such unique eye morphology to facilitate joint attentional and communicative interactions among conspecifics. (See also Wolf *et al*. 2023.) Yáñez & Gomila 2018, who also underline 'the interactional importance of gazes', add: "especially when oneself is the focus of that attention", i.e., during eye-contact. I will specify this emphasis on cooperation and interaction to connect it with my proposal of the 'unified', effective reception of pointing gestures. Let's start by redescribing "the enhanced visibility".

Mayhew & Gómez 2015, Perea-García *et al*. 2019 (but see Mearing & Koops 2021) and Caspar *et al*. 2021 have proposed that the chromatic contrast in human eye is not unique among ape species. But let's focus on horizontal elongation. This feature may have evolved to allow non-arboreal primates to scan their environment widely. Despite that, such elongation together with the universal "totally/bilaterally white sclera" make the location of the iris conspicuous not only in averted but also in direct gaze. In addition, "the eye-outline is easier to see in humans (than in apes) irrespective of skin color" (Kano *et al*., 2022), and this makes the location of the iris even more conspicuous. See also Prein et al. (preprint), who conclude that human 'gaze understanding' is "based on the pupil location within the eye". Thus, *human eyes –this is my point– make the successive locations (that is, the horizontal travelling) of the iris conspicuous*.

In this way, *the continuity of the two gazes* in pointing (or, in other words, the crucial –remember Paulus & Fikkert 2013– alternation between gazes) *is really enhanced*. It might be said that, when the producer moves his iris from the 'gaze towards the object' to the 'gaze towards the recipient', that movement is perceived by human recipients like if it was injecting the 'gaze towards the object' –and, consequently, also the vicarious expectations activated by recipients– into the 'gaze towards the recipient', that is, into the communication. So, the human eye would lead the human recipient of pointing gestures to unify the two instants –and, therefore, to estimate the producer's mental states that, involving himself, i.e., the recipient, as their distal addressee, are intrinsically impossible for this addressee– and, therefore again, to estimate 'foreign mental contents'.

In short, in my view, human sclera is an *anatomical, universal* 'facilitator resource' of a mental process –the unified reception, of course– in the recipient. It is also a *strong* 'facilitator resource'. These qualifications could maybe arise the suspicion 1) that the 'unified' communicative reception of pointing gestures was the evolutionary first function of the ability of estimating foreign mental contents, and 2) that this estimation –this duality of contents– was originally difficult and demanding.

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making some movement towards– a particular prey, this could be an innately communicative signal, which would pre-activate in the members of the herd a plan of attack in the signaled direction. So, when, shortly after, the wolf-recipient feels that he is being looked at by the dominant individual, he starts its previously pre-activated attack plan. In this way, dogs would just make richer their innate expectation of the first signal –i.e., they would learn to associate their innate expectation with some other features (hand or finger). In addition, I prefer, as said in previous note 14, to focus on primates.

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However, such deductions (let us not forget!) would require us to choose the option of the synchronic emergence between human eyes and human Theory-of-Mind.

The depigmented sclera could become universal in an evolutionarily very short time, and therefore (if there was such synchronic emergence) the human sclera could arise in the same species in which the effective, unified reception of pointing gestures was beginning to emerge. But did it happen in Sapiens? And if so, did it happen at the very beginning of our species? Or later?[46] Or did it emerge in Neanderthals / Denisovans? This can be a crucial question. I hope that Paleogenomics and Genomics specialists will answer it soon. Certainly, the depigmented sclera is a quite simple feature. However, its universality makes, of course, their task difficult.

If we follow the option –the faint hope, as I said in 7.1– that the peculiarity of human eyes emerged in relative synchrony with human Theory-of-Mind, then we could propose that this facilitator is an essential basis for the human communicative reception (i.e., our ability to understand messages as foreign *mental* states and, simultaneously, as *addressed* to ourselves). But such proposal can accept either that such basis –such estimation of foreign *contents*– emerged in Sapiens, or that, on the contrary, in Sapiens, only its derivations (see above, Section 6) emerged, while the estimation itself had emerged in Neanderthals. In short, that option, in addition to being based on a 'faint hope', could predict only that the human type of eye will not be found in earlier hominins. Therefore, regarding Neanderthals, it does not possess a strict falsifiability. This is an extremely unfortunate fact, since it is just the Neanderthal genome that is being studied. Anyway (and returning again to 7.1, but now to the recommendation that "we should not rule out anything that can provide us even a little bit of light"), the question of whether Neanderthals –or even, as suggested in note 46, our species in its beginning– possessed eyes like ours should be answered. If such answer is negative, then it could give us a useful supply of light. But now all this is just a very faint hope.

I do not want this last paragraph, with its lack of confidence and pessimistic tone, to mark readers' final impression on my hopes. Please remember that such tone has not been the norm for this article. Indeed, as said above, I'm much more convinced of my general proposal than of the synchrony between the emergences of the human type of eye and of the human Theory-of-Mind.

8. Summarizing, and Looking Towards the Future

This article has hypothesized that the contrast 'vicarious expectations *versus* foreign mental contents' is a genomic, brain novelty that appeared in co-evolution genes/culture. Thus, I have proposed that such novelty was required by 'the new, human lifestyle', which was increasingly technologic (humans are 'obligatory' users and producers of tools) and cooperative (with a way of cooperating that is based in communication). More concretely, in the origin of this lifestyle, two extremely important abilities (self-conscious emotions and, more basically, the advanced reception of even prelinguistic messages) required, according to my proposal, the ability of estimating foreign contents.

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[46] This possibility is not at all an absurd suggestion. Firstly, within the lineage of Sapiens and even in dates totally within the (formerly so-called) 'anatomically modern humans', there is a marked evolution in the shape of the cranium: See Neubauer *et al*. 2018 (although, at least since 160.000 b. p., these differences with living humans would mainly affect, according to Zollikofer *et al*. 2022, the face and cranial base). See also Freidline et al. 2024: "The unique facial growth pattern of Homo sapiens post-dated the Middle Stone Age". Secondly, regarding our progressive absence of prominent brow bridges –which were very prominent in Neanderthals–, Godinho *et al*. 2018 reject the old hypotheses on such absence and suggest "its potential role in social communication". (See Siposova *et al*. 2018, who underline the role of raised and highly mobile eyebrows in "the reception of communicative looks". Likewise, Gast 2023 focuses on the link between linguistic prosody and eyebrow movement.) I also ask: Could the chin, whose absence in Neanderthal has been so studied (cf. Meneganzin et al. 2024), strengthen the gestural, emotional expressivity of the mouth?

The key to my argument has been that only in human communication the addressee has to think foreign (i.e., others') *mental* states as states *addressed* to him. Am I asked about the general features of my proposal? As the reader already knows, it is dialogic, embodied and deeply embedded in evolution.

I have proposed that the advanced –uniquely human– Theory-of-Mind and human (even prelinguistic) communication are inextricably linked. Or more precisely: On the one hand, the set of those two abilities and, on the other hand (and more initially), the new lifestyle, feed off each other in a growing spiral. Therefore, while there is no suggestion on my part that all uniquely human capacities evolutionarily arose at the same time, I maintain that one of them –namely, the estimation of foreign contents, and not only of vicarious expectations– underlies the rest.[47]

The contrast 'extinct species of Homo *versus* us', if it becomes finally an area of Comparative Neuroscience, might fulfill in a special way the promise to help us to 'know ourselves', as classical philosophy wanted.[48] Such a result could perhaps be achieved with the help of Genomics / Paleogenomics and also with "the use of evolution to identify meaningful categories of mental activity" (Cisek 2019 or Cisek 2020, which apply this resource to animals in general). But the use of co-evolution genes / culture is also necessary to identify categories of human mental activity. In other words, the nuclear categories of human mental activity will be more easily found the more we seek their link with the emergence of the human lifestyle.

Returning to the nuclear proposal, this article has not offered any new empirical result. However, the main proposal and each sub-proposal raise questions. Let us mention some of those questions. My view of expectations? Apes' vicarious expectations? The anti-intuitive 'non-unified reception of pointing' in chimpanzees? Interpersonal origin of syntax and syntactic semantics? Is there genuine metacognition in great apes, or, on the contrary, only 'subpersonal uncertainty estimates'? These questions can lead to different experiments and to research in Neuroscience or Genetics, whose results will have an impact on my proposal, in one way or another. But I have already dealt with this above.

Therefore, I will add only a more personal comment. I am really looking forward to those results that can make my hypothesis testable. Even if those results discarded my proposals, I would feel that my effort has been useful. Obviously, the hypotheses are most useful when they point out a correct path, but if an apparent road really leads nowhere, then the task of promoting its testability is also a service to community. In short, I ardently wish that these tests are conducted. However, since such empirical research is out of my reach, I can only request them. This is what this article would want to do now and in the medium-term future.

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[47] Regarding such later rest, I would underline creative (technical, scientific or artistic) problem-solving and what I called in previous note 19 'the most demanding moral capacity'.

[48] Currie et al. 2024 : "Philosophical methodology can benefit greatly from interaction with cognitive paleoanthropology. […] Coherent evolutionary narratives is a means of readmitting synthesis to the philosophical toolkit". Or, more imprecisely, "The current focus on hominids and Neanderthals opens a new door for us which was undreamt of for previous philosophers and scholars" (Bejarano 2022).

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