



What is it like to be a chimpanzee?

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Abstract

Chimpanzees and humans are close evolutionary relatives who behave in many of the same ways based on a similar type of agentic organization. To what degree do they experience the world in similar ways as well? Using contemporary research in evolutionarily biology and animal cognition, I explicitly compare the kinds of experience the two species of capable of having. I conclude that chimpanzees' experience of the world, their experiential niche as I call it, is: (i) intentional in basically the same way as humans'; (ii) rational in the sense that it is self-critical and operates with logically structured causal and intentional inferences; but (iii) not normative at all in that it does not operate with "objective" evaluative standards. Scientific data do not answer philosophical questions, but they provide rich raw material for scientists and philosophers alike to reflect on and clarify fundamental psychological concepts.

In 1974, Thomas Nagel asked if it is possible for a human to imagine what it is like to be a bat. He claimed that it is not. Simple imagination fails because humans do not have the requisite sensory apparatus. Physicalist explanation fails because conscious experience is essentially subjective, whereas physicalist explanations attempt to be independent of subjective factors. Nevertheless, near the end of the paper Nagel proposes that we might be able to develop concepts that would enable us to make progress on the problem, within limits, using nonreductive scientific descriptions (p. 450): "[The] goal would be to describe, at least in part, the subjective character of experiences in a form comprehensible to beings incapable of having those experiences."

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Nagel was writing at a time before cognitive science as a discipline had fully emerged, and there was almost no research on the cognitive processes of nonhuman animals. But in contemporary comparative and evolutionary psychology there now exists a large body of research on the cognitive processes of a wide variety of animal species in comparison with one another and with humans. One might argue that this research and the concepts it employs provide exactly what is needed, as a starting point, to accomplish Nagel's more modest descriptive goal. This research clearly does not address all of the many and varied fundamental questions about phenomenal consciousness that Nagel's paper has spawned. But what this research can answer with the normal amount of scientific confidence is how some creatures experience the world as well as, in some cases, their own functioning in that world. Or so I will argue.

A good species with which to begin such an exercise is the chimpanzee, with whom we share an evolutionary ancestor from not so long ago and about whom we know a great deal scientifically. The goal would be to characterize the kinds of experience that chimpanzees are capable of having in comparison to the kinds of experience that humans, as its investigators, are capable of having. This comparison is not only more straightforward than the comparison of bats to humans, but the great psychological similarity of chimpanzees and humans makes it potentially more philosophically enlightening as well because it forces us to make precise and often subtle distinctions with regard to such philosophically important concepts as intentionality, rationality, and normativity. Indeed, my claim will be that chimpanzees' experience of the world is intentional in basically the same way as humans', rational in some ways but not others, but not (socially) normative at all.

1 Agency and experience

I begin with two assumptions, one theoretical and one methodological. First, my theoretical assumption is that organisms are built by natural selection to experience just what they need to experience in order to act effectively in the environment. Nature selects for effective action production, and the underlying psychology involved – including how the organism experiences the world as a way of directing its actions – evolves in, and only in, this action-structured context. This is basically a modern version of the most fundamental tenant of classical American pragmatism that "knowing the world [is] inseparable from agency within it" (Legg & Hookway, 2020, p. 1).

If each species lives in its own ecological niche as determined by what it needs to do to survive and thrive, and if experience is structured by action, then we may also say that each animal species lives in its own **experiential niche**: those parts and aspects of the environment that it is perceptually and cognitively equipped to experience so that it can do what it needs to do to survive and thrive (a modern version of von Uexküll's, 1934, concept of "umwelt"). Thus, one species of bird perceives and attends to the likely habitats of worms in tree bark while another does not, and of course the worms themselves live in a completely different experiential niche. This is the general point about experience made by Mead (1934, p. 245) when he says

that “The individual organism determines in some sense its own environment by its sensitivity.”

Beyond straightforward action and perception, an organism’s ability to understand more general things about its environment cognitively and to make inferences about those things in acts of thinking, broadly construed, are also attuned to what it needs to do behaviorally. How this is done differs across species. Thus, single-celled organisms have a fairly direct connection between perception and action, both effected by the same set of cilia, whereas more complex organisms are organized in more flexible ways cognitively. Specifically, complex agents direct (or even plan) and control (or even executively self-regulate) their own actions (Tomasello, 2022), and this requires them to attend to particular kinds of experiential situations that are relevant for this kind of decision-making. And those agents that operate with an executive level of functioning also attend to their own goal-directed actions—so that they can monitor them and intervene as necessary—which could then be considered a part of their experiential niche as well. My hypothesis is therefore that, beyond simple perceptual and action capabilities, the *type* of agentive organization characteristic of a species determines the *types* of experience it is capable of having.

Characterizing the different types of agency requires a particular kind of theoretical model. As the pragmatists already knew, the linear causal structure of stimulus and response, as propounded by behaviorists, is not up to the task. Complex organisms are not passive reactors to stimuli, but rather they actively pursue goals (or other pro-attitudes) and use perceptual feedback of the results of their actions to make ongoing adjustments as necessary. In his famous paper on the reflex arc concept in psychology, Dewey (1896, p. 365) was explicit: “The fact is that stimulus and response are not distinctions of existence, but teleological distinctions, that is, distinctions of function, or part played, with reference to reaching or maintaining an end.” And James (1890, p. 8) claims further that such agentive behavioral organization is foundational for all things mental: “The pursuance of future ends and the choice of means for their attainment are ... the mark and criterion of the presence of mentality in phenomena.” In contemporary cognitive science, agency is prototypically embodied in cybernetic models of goal-directed action based on mechanisms of feedback control, as pioneered by Miller, Galanter, & Pribram (1960) and as refined by many others since (e.g., computational models such as that of Gershman et al., 2015). Models of this type enable us to characterize in a single framework the structure of different types of agentive organization and their corresponding types of supporting experience.

Second, my methodological assumption reflects an about-face that has occurred in the study of animal behavior and cognition in past several decades. In 1974 the implicit assumption was that nonhuman animals are very different from humans psychologically, and the burden of proof was on those who wished to show similarity. But now, based on evolutionary theory and research, the implicit assumption has shifted poles, at least for most researchers, and the common assumption is that species who share a relatively recent evolutionary ancestor should be similar in many ways, including in their psychological capacities. Although this may not apply to species who do similar things as humans but who do not share a recent evolutionary ancestor – for example, octopi (Godfrey-Smith, 2016)—close evolutionary rela-

tives should, all things being equal, also share general forms of experience, justifying meaningful comparisons.

In the case of humans and chimpanzees, in particular, we now know that six million years ago there was only one species: the last common ancestor to chimpanzees, bonobos, and humans. Since this is not such a long time ago evolutionarily, and since genetic transmission is a conservative process (in the absence of natural selection or transcription error), many psychological processes are essentially the same in the three species—underlain by the same conserved genes—suggesting that their experience of the world is in many ways the same as well (this is dubbed by de Waal, 1999, the continuity assumption). Thus, since humans and chimpanzees have basically the same eyes and ears and react behaviorally in similar ways to many sights and sounds, it is likely that we humans can accurately comprehend and even imagine how a chimpanzee sees a rock or hears a bird's chirping. Needless to say, of course, continuity does not mean identity; the continuity assumption is a default assumption only, ready to be overturned with empirical evidence.

My working hypothesis, then, is that the behavioral organization characteristic of a species – in particular, the type of agentive processes with which it generates its actions – determines the structure of its experiential niche. This enables us to use behavioral experiments, in which an organism must perceive or understand the world in a certain way in order to act effectively in it, to make inferences about its experience. Of course, in principle the organism could be acting based on experience of the world very different from that of its human investigators and we would never know for sure; this is Nagel's point. But that is where the continuity assumption fills in the gap: when a species is closely related to its human investigators, and then in an experiment individuals of that species behave in the same basic way as humans, we assume that the two species are experiencing the situation in similar ways. From this starting point, in what follows I attempt to characterize the general nature of chimpanzee experience by contrasting it first with that of mammals in general and then with that of humans.

2 Intentional agency and experience

There is a basic distinction in the study of animal behavior between actions that are stimulus-driven and those that are goal-directed (Yin & Knowlton, 2006). Many of the actions of very simple creatures are stimulus-driven. Thus, the first organisms on planet Earth came into existence literally swimming in food: they were unicellular organisms that simply swam around randomly in nutritious water as more-or-less “filter feeders”. They did not act to pursue and consume food and then stop at some set point (indicating goal pursuit and satisfaction); they just constantly moved around and consumed. Their contact with the world was via molecules sensitive to nutritious chemicals, which drove them to approach, and noxious chemicals, which drove them to flee. Such simple creatures cannot decide **not** to move toward nutritious chemicals, even when they are already sated, and they cannot make connections between their actions and the results to determine success, since without a goal there is no notion of success or failure. Later in evolution, at the very latest with the first vertebrates,

organisms began structuring their actions via internally represented goals, which they attempted to realize with at least a modicum of flexibility.

Mammals came out of this line of creatures, and although contemporary mammals have many different behavioral specializations – from bat echolocation to squirrel nut caching – they all retain this general manner of goal-directed functioning inherited from their common ancestor. All mammals rely on the same basic sensory organs supporting vision, audition, touch, and taste/smell, operating in a world of objects and events with spatial and temporal structure (even bat echolocation is a simple extension of basic auditory processes to locate things). Also, most mammals appear to experience basic emotions such as fear, anger, surprise, contentedness, and aversion. Fridja (1986) conceptualizes emotions as “action tendencies” in that they provide specific motivations for specific actions, such as fleeing when experiencing fear or continuing to do things like huddling in a burrow that produce contentedness. But mammals also act more flexibly to pursue internally represented goals, that is, they act so as to bring their perception of the state of the world into line with their representation of some desired state.

Organisms such as mammals whose behavior is often goal-directed experience the world in a particular manner. Specifically, they cognitively represent goals as situations that they value, in the sense that they are motivated to bring them about. Goals (and other pro-attitudes) are represented not as objects but as situations. Davidson (2001, p. 126) says: “What one wants is ... that one has the apple in hand ... Someone who intends to go to the opera intends to make it the case that he is at the opera.” As they pursue a goal, therefore, mammals attend not to objects but to situations, that is, relevant situations. They do not perceive and experience everything they are capable of perceiving at any given moment; rather, they *attend* to just those environmental situations that are *relevant* for their goal-directed actions (as either opportunities or obstacles for goal attainment). Importantly, many different situations are potentially discernible within the same perceptual image, for example, the same perceptual image might provide raw material for attending both to an opportunity to get food and to an obstacle for getting it. Attention thus goes beyond perception in being intentional or mental, in the sense that it is directed to, it points to, some aspects of the perceptual world to the exclusion of others, namely, those that are relevant to the goal situations that the organism values. Mammals’ experience during goal-directed action is thus formatted in terms of situations – as nonlinguistic bases of propositional content – with the key distinction being between situations that are imagined and valued (as goals) and those that are attended to in the environment as facts.

In addition to operating with basic attention and action, mammals also operate with an executive tier of functioning. In particular, they often cognitively simulate possible action plans and then make either-or decisions among them prospectively. The choice among potential action plans is based on their predicted outcomes as the organism simulates them (based on the relative value and probability of each outcome, or else some heuristic; Gigerenzer et al. 2011). This is as opposed to some simpler forms of decision-making, characteristic of less complex creatures (e.g., reptiles), in which the organism just makes a go/no-go decision concerning a single action (which does not require an executive level of functioning). Mammals’ more complex form of comparative decision-making can be seen, for example, when squir-

rels in experiments are attempting to decide among alternative goal locations and they pause and look back-and-forth between them before actually acting (Chow et al., 2015). It is also implied in traveling salesman experiments with rats in which they appear to survey all of the alternative locations (each with a reward of different value) and then imagine the most efficient route before setting out (Blaser & Ginchansky, 2012). And it is especially clear as rats in the so-called opt-out paradigm avoid a difficult discrimination problem, with the potential of a large reward, but rather opt for easy access to a small reward (Templer et al., 2017). Although there are richer and leaner interpretations of this opt-out behavior, at the very least the rats are attending to and monitoring their internal state of uncertainty.

Given this executive level of oversight and decision-making, we might say that mammals' actions are not just goal-directed, they are intentional. Cognitive simulation and planning – with a prevision of errors and inhibition of undesirable alternatives—enable the individual to organize and choose its actions more flexibly and on their relative merits, as in Bratman's (1987) planning theory of intentional action. Piaget (1952) emphasizes that in intentional action the individual has the goal “in mind” ahead of time throughout planning and execution – i.e., on the executive tier – as it decides what to do and does it. These complexities are most clearly evident when the organism's actions must be sequenced in a particular way to achieve a goal, or else when one action must be embedded within another as a sub-plan for doing things like removing an obstacle on the way to goal attainment. Thus, as a squirrel plans a trek out a tree branch to fetch a nut, it might not execute that plan until it can first cognitively simulate a successful sub-plan for removing a dead branch that is in the way. Importantly, organisms that organize their actions intentionally from an executive tier seem to understand that their actions actually *cause* the environmental outcome (see Dickinson, 2001, for this argument and relevant evidence from rats).

All of this empirical evidence suggests that mammals are intentional agents who operate with something like instrumental rationality aimed at goal success. They do this by simulating and choosing among action plans on an executive tier of functioning that outputs not an action but an intention to act, which might possibly be inhibited or altered before execution. For scholars who have not switched to the default assumption of species continuity, this may seem too rich an interpretation of the behavior of rats and squirrels and other mammals. One difficulty for these scholars, especially prevalent in some strains of philosophy, is the belief that thinking requires language (e.g., Davidson, 2001; Brandom, 1994; McDowell, 1994). While it is of course true that humans can engage in some forms of thinking not available to other creatures – precisely because of their use of language and its propositional format – it is also plausible to propose that the most basic form of thinking is not language-based but rather perception-based (see Bermudez, 2003, for this argument). Thinking in its most basic form is simply off-line perception, or imagining, with the representational format being iconic, including categorical generalizations of iconic representations.

The psychological organization of intentional agents generates complex forms of experience. Intentional organization leads individuals to experience not just stimuli or objects, but rather situations in the world that are relevant for their goals. And their executive tier of supervision and control leads them to experience not only situations in the world, but also their own operational tier of goal-directed action; that

is, from an executive tier of planning and decision-making they attend to their own goals, actions, and environmental results (enabling instrumental learning). What we call conscious experience – attending to one’s own psychological functioning—is thus created by an executive tier of oversight and control. This view of conscious experience is broadly consistent with neuroscientifically based, two-level theories of consciousness, such as that of Graziano (2019), in which consciousness is conceptualized as the organism’s cognitive model of its attention to the world, what he calls “the attention schema”. Presumably, from a pragmatic point of view, the function of an executive tier of operation is to facilitate behavioral decision-making, as the individual attends from this executive tier to whatever is relevant to its effective behavioral functioning, including not only relevant environmental situations but also its own goals, actions, and caused results. We may thus hypothesize that, beyond simple sentience of the external world, all mammals, including bats, very likely have conscious experience via executive attention to the constituents of their own goal-directed actions.

If we now wanted to imagine what it is like to be one or another kind of mammal, we could do this in a very general way because we humans too pursue valued goal situations and attend to relevant facts, and also attend to our own goal pursuit from an executive level with which we plan and make either-or decisions before acting. That is to say, humans operate in similar ways to all other mammals and so have similar experiences in some contexts. These would be very basic contexts of goal-directed action, perhaps especially those not involving the manipulation of objects (since mammals do not engage in much of this). Good examples might be attention-absorbing things like climbing a tree or swimming across a lake or running to escape a predator that do not involve culture, language, or self-consciousness. In such cases, the human individual is engaged in planning and making decisions and performing sensorimotor actions based on attention to relevant opportunities and obstacles in their immediate environment, as well as to their own behavioral functioning. We of course cannot know what it is like to be like a bat or any other mammal in particular to the extent that the content of their experience is different from human experience based on different perceptual or cognitive processes. But to the extent that the perception and attention of all mammals is similar – and we are defaulting to that assumption – then we can, at least to some degree, imagine the basic form of their experience.

3 Rational agency and experience

Mammals thus function as intentional agents who selectively attend both to relevant situations in the environment and to the constituents of their own goal-directed actions so that they can make the best behavioral decisions. We may thus say that mammals are instrumentally rational not only in the minimal sense that they intelligently pursue their goals (the economists’ minimalist definition), but also in the further experiential sense that they know what they are doing.

A number of philosophers have addressed the issue of animal rationality, using a variety of different definitions and criteria (e.g., see Okrent, 2007, and the vari-

ous papers in the edited volumes by Hurley & Nudds, 2006, and Andrews & Beck, 2018). None of them believes that any nonhuman animal is rational in the human sense – requiring adherence to socially constituted rational norms and the ability to provide explicit reasons for one’s actions – but many scholars attribute to one or another species at least some capacity for rationality involving either actions or decision-making. The proposal I defend here is that chimpanzees and other great apes (I remain agnostic about other nonhuman primates) are **reflectively rational** in their agentic decision-making – in a way that other mammals are not—and this leads to some novel ways of experiencing the world. Specifically, as chimpanzee agents are deciding what to do: (i) they attend to underlying causal and intentional relations in the world, organized into logical paradigms of implication, which brings rational coherence to how things work; and (ii) they rationally reflect on their own process of decision-making (via a second-order tier of executive monitoring and control, a.k.a., metacognition) that enables them to diagnose problems in their first-order executive decision-making and to intervene in them. These two features are connected in the sense that reflecting on one’s own process of decision-making makes available the concepts necessary for attributing causal and intentional relations to entities and events the external world.

3.1 Understanding the logic of causes and intentions

Organisms that understand causality do not just understand what is happening, but also, to some extent, why it is happening, which creates the agentic possibility of manipulating the cause in order to produce the effect (Woodward, 2003). Thus, in experiments involving a completely novel problem, chimpanzees are able to choose a tool that is causally appropriate, and, moreover, to take control of the causal process and make new tools that will work in the new context.

But beyond exploiting tool properties as enabling causes, chimpanzees can also understand causal forces that operate totally independent of their own actions. For example, in one study chimpanzees knew without training that among a series of opaque bottles, those that were heavy must contain the tasty liquid they were seeking whereas those that were light must not (Hanus & Call, 2008). And in a study in which they could not act on the objects at all, they inferred that when one end of a balance beam tilted down it meant that the opaque cup on its end contained a banana (whereas the cup on the other end did not; Hanus & Call, 2011). These studies indicate that chimpanzees understand that heavy things exert a downward causal force. Importantly, in some instances, chimpanzees seem to assume that even when there are no obvious causal forces at work, there must be some somewhere, and so they attempt to discover them. Thus, when chimpanzees were rewarded for taking overturned blocks and setting them upright, and then one of the blocks would not stand upright, some of the chimpanzees picked up the recalcitrant block and visually inspected it underneath, seemingly trying to discover the cause of the problem (Povinelli & Dunphy-Lelii, 2001).

Great apes’ causal understanding generates creative inferences organized into logical paradigms. For instance, in the experiments on tool choice, apes infer such things as “if a tool with property A is used, then B must happen”. Then, actually using

the tool completes the inference: (i) if A is used, then B happens; (ii) A is used; (iii) therefore B should happen. In other experiments, apes can make backward-facing inferences from effect to cause, in this case using exclusion based on a simple kind of negation (what logicians call contraries). Thus, Call (2004) showed a chimpanzee a piece of food, which was then hidden in one of two cups. Then, in the key condition, the experimenter shook the empty cup. The chimpanzee observed only silence. To locate the food the chimpanzee had to infer backward in the causal chain to why that might be, namely, that there was no food inside the cup. The chain of inferences was thus something like: (i) the shaking cup is silent; (ii) if the food were inside the shaking cup, then it would make noise; (iii) therefore, the shaking cup is empty (and so the food is in the other cup). Following Bermudez's (2003) analysis, these inferences and paradigms involve the two key elements of logical thinking: the if-then conditional and negation. Both occur in only "proto" form: the if-then conditional is proto because it only concerns causal (not formal) relations, and the negation is proto because it only concerns contraries such as presence-absence, noise-silence, etc.

Causality operates differently in the animate world. To understand an agent's actions, one must understand that its behavior is generated by the goals toward which it is aiming and the perception/knowledge it has about how to achieve those goals in the situation. Knowledge of an agent's goals and perceptions in a situation then enables prediction of its behavior. Thus, for example, when a subordinate chimpanzee is competing for food with a dominant, it can take into account whether or not that dominant sees a potentially contested piece of food (because of judiciously placed barriers). And it even can tell if the dominant has seen the food in that location in the immediate past and so knows it is there (even though at the moment it cannot see it; Hare et al., 2000, 2001). In general, in such experiments, apes understand that a competitor will go for an object only if: (i) it wants or has a goal/desire for that object (i.e., it would not compete for a rock); and (ii) it perceives or knows that that object is in a certain location. Chimpanzees thus understand how competitors work as agents – that is, in terms of their goals and perceptions—and can use this understanding in novel contexts to predict their behavior. In addition, at least some chimpanzees seem to understand even more about an agent's decision-making process. In particular, human-raised chimpanzees do not imitate a human performing a strange action, such as turning on a light with his foot, when he has no other choice since his hands are otherwise occupied: he is not freely choosing to use his foot and so I should not imitate him since I have a free choice and so can use my hand, as normal. But chimpanzees do imitate a human when he has freely chosen that same strange action in the absence of constraints (since he and they are similarly unconstrained). This process has been called "rational imitation" because the social learner is comparing its own process of situation-sensitive decision-making to that of another agent (Buttelmann et al., 2007).

As in the physical/causal domain, in the social/intentional domain apes' inferences are logically structured. In the food competition experiments the competitors inferred of one another in this situation: if he has the goal of getting the food, and he perceives its location (and so knows how to get it), then he will go for it. But if he does not have the goal, or does not perceive a way to achieve it, then he will not pursue the goal. And from the other direction: if my competitor is engaged in a particular activ-

ity, then she must have had both a relevant goal and a relevant perception. These inferences constitute a kind of logically structured paradigm analogous to the human practical syllogism. Moreover, in the rational imitation study, chimpanzees made a backward-facing exclusion (counterfactual) inference based on proto-negation. Specifically, when they saw a human operate a device with his foot when his hands were externally constrained, they inferred from his behavior backward to his decision-making: (i) he is not using his hands; (ii) normally, if he had a free choice, he would be using his hands; (iii) therefore he must not have a free choice (so I can ignore his action choice). As in the case of logically structured causal inferences in the physical domain, then, these logically structured inferences about others' intentions and actions in the social domain employ the two most basic elements of human logical thinking: proto-conditional (if-then) causal inferences and proto-negation based on contraries.

Chimpanzees thus seem to understand the underlying causal and intentional structure of their physical and social worlds – why things happen as they do—in ways that other mammals do not. And they see these causal and intentional relations as logically interrelated; their physical and social worlds make rational sense.

3.2 Reflective planning and decision-making

Like all mammals, great apes plan their actions. But, in addition, they can plan for a future goal that they do not at the moment actually have. Thus, when they are sent out of a room in which they have previously chosen and used a tool successfully, they will take with them the tool that they can anticipate they will need in the future, assuming that the problem situation recurs (the study is actually with chimpanzees' sister species bonobos; Mulcahy & Call, 2006). Planning for a future imagined goal in this way would seem to require some new executive, that is reflective, cognitive skills. Such skills would also seem to be required when chimpanzees are able to perceive and resolve a goal conflict by comparing how the means to achieve different simultaneously present goals are incompatible but could be made compatible (Herrmann et al., 2015).

Chimpanzees' ability to reflect on their executive functioning is on full display in experiments on their decision-making. Thus, in one study chimpanzees either did or did not witness a human hiding food inside of one of several tubes. When they witnessed the hiding process, they chose a tube immediately. But when they did not witness the hiding process, they went to some trouble to look into the tubes to discover where the food was located before choosing. The apes knew when they did not know, or at least when they were uncertain, but beyond simply opting out they diagnosed that they were missing a specific piece of information and then determined how to acquire it (Call & Carpenter, 2001; Call, 2010; Bohn et al., 2017). This would seem to require reflecting not just on one's behavioral functioning but on one's process of decision-making. Attempting to causally diagnose problematic decisions before they are behaviorally executed fulfills a standard criterion for rationality: self-critical reflection on one's own decision-making. Such behavior also indicates that they are employing a kind of "computational rationality" (Gershman et al., 2015) in the

sense that they must decide if the potentially available information is worth the effort needed to gather it.

In a variation on this theme, chimpanzees seem to reflect on their decision after they have made it to see if they have made a mistake. In an experiment apes were given the opportunity to visually locate the best food at location X. They did this, indicating their belief by choosing that location (though not receiving the food as a result). Then, they were exposed to new information that called their initial belief into question: the new information suggested that the best food might be in location Y. The apes had the possibility at this point to seek further information (or not) that could either confirm or disconfirm their initial belief. Many apes then actively sought more information to resolve the discrepancy between their original belief and the new information, by looking into location X from another angle to double-check their initial judgment (so as to make the best decision; O'Madagain et al., submitted). The apes in these cases were self-monitoring and controlling their executive decision-making after they had made an initial decision; they were reflecting on the decision in the light of newly obtained information and discerning the need to possibly revise that decision.

Planning for future goals, resolving goal conflicts before making a final decision, and diagnosing problems and intervening in executive decision-making, all reflect chimpanzees' ability to executively monitor and to some degree control their own executive functioning. This suggests that not only do they have an executive tier of functioning in the manner of all mammals, but, on top of this they operate with a second-order reflective tier of executive supervision and control, relying on what have been called metacognitive skills. Most mammals are self-regulating their intentional actions executively, but in the absence of a second-order reflective tier of functioning they cannot monitor and control the executive decision-making processes themselves. In contrast, chimpanzees monitor and control not only their goal-directed actions, but also the cognitive processes involved in their own executive functioning. Mammals attend to what they are doing, but chimpanzees, in addition, attend to what they are thinking (via processes of metacognition; see Carruthers, 2005, for a higher-order theory of consciousness and Shea & Frith, 2019, for a "global workspace" model of metacognition that are somewhat similar to this account).

3.3 Second-order executive (reflective) functioning

Importantly, the reflective tier of agentive organization was crucially important in the evolution of chimpanzees' unique cognitive skills for understanding logically interconnected causal and intentional relations in the external world. Specifically, chimpanzees' understanding of causality and intentionality resulted from an attribution to external events of some of their own decision-making processes that they were now able to consciously access from their new second-order reflective tier of functioning, which also provided the common workspace and representational format necessary for comparing and aligning internal (1st person) and external (3rd person) events in the attribution process. The way this worked was similar but slightly different for intentionality and causality.

Beginning with the “easier” case, chimpanzees understand others as intentional agents acting and making decisions toward goals as guided by perceptions. The proposal is that this understanding originates evolutionarily with self-experience, a variant of so-called simulation theory (Gordon, [in press](#)). The point is a conceptual one. If a Martian came down to earth and informed us that without any obvious organs it could still “see” things, how could we understand this except through our own experience of seeing. If the Martian said it could “grue” things based on some kind of radiation unknown to humans, how could we understand this without any firsthand experience? There is always an element of “theory” as well, of course, because the other agent’s particular experience is different from ours in its specifics: perhaps it has perceptual access to something that we do not. But the equating of self and other experience is a necessary prerequisite.

Several studies demonstrate chimpanzees’ ability to understand the experience of others in terms of their own experience. In one study, a chimpanzee experienced a situation in which it could see through a screen lid on a box to detect what was inside (Karg et al., 2015). The box was then reoriented, so that now from the chimpanzee’s new side-viewing angle, the screen lid was opaque. A competitor then approached the box and looked straight into it, from the angle that the chimpanzee subject had used originally. When the two of them now competed for the food inside the box, the chimpanzee subject knew that the competitor could see through the lid to the food inside even though she herself could not see the food at the moment. The only way the subject herself could know this was from her own previous experience of having looked directly through the lid into the box from the original viewing angle, which she was now attributing to the competitor. (See studies by Kano et al., 2019, and Schmelz et al., 2013, for further evidence along these lines.)

The process of attributing mental states to other agents based on one’s own mental states is at least relatively straightforward because there is a clear similarity between the actions of self and other: all individuals of the same species, including the self, are highly similar in their bodies and behavior (and so the individual is able to use so-called “inverse planning” to predict the other’s actions; Baker et al., 2009). But the generalization from self to other is not nearly so straightforward when considering attributions to physical events involving inanimate objects and physical causality. Unlike animate agents, physical objects only move when they are “forced” or caused to move by an animate agent (or else by some mysterious action at a distance like gravity, which Isaac Newton himself considered an occult force). David Hume (1739/40) thus wondered about the basis of human causal understanding. When one billiard ball strikes another and knocks it across the table, we experience only a spatial-temporal contiguity: a moving ball contacts a stationary ball and it then moves, seemingly as a result. But what justifies an inference that there is a causal “force” involved?

Recall the argument that rats do not just associate their act with its result, but they understand that their act caused the result (Dickinson, 2001). But there is a huge gap between the experience of such internally generated causality and external causality among inanimate objects. Piaget’s (1952) idea is that what bridges the gap is the use of tools, at which chimpanzees are expert. To use a tool flexibly and reliably there must be an integration of the movement of the tool, as caused by the agent, and the

properties of the tool in relation to the substrate. Therefore, the cause of successful tool use is *both* the organism's action and the properties of the tool in relation to the substrate, across the organism/environment divide, as it were. But in the process of tool use, the causal properties of the tool are only participating passively as enabling causes. It is still a further step to understand objects as exerting a causal force on their own, independent of the self's own actions. For this, it may be that the ape needs to somehow see physical objects as operating in the manner of intentional agents, that is, on analogy with the causal relations that hold between an agent's action and its effect in the environment. Perhaps apes are making some such animistic attribution to physical events, and this is the basis for their understanding of causal forces (just as humans may do; Collingwood, 1940, p. 322, suggests: "Causal propositions ... are descriptions of relations between natural events in anthropomorphic terms.").

Evidence for this proposal comes from the fact that chimpanzees structure their causal understanding into paradigms of logical inferences, as described above. If they know that event X causes event Y, then they know that if X happened then Y did also, and also that if Y did not happen then X did not either. Such logically structured inferential paradigms constitute evidence for a self-based hypothesis for the origins of causal attribution because they almost certainly derive from the causal logic of the agent's own actions. Thus, the kind of causal understanding of one's own action that rats possess yields such inferences as: if I act, there will be a result; if I do not act, there will not be a result; if there is no result, then I did not act causally effectively; if only one of two ways can cause a result, and the first one is not causally effective, then the other one will be causally effective; and so on. These kinds of inferences are made on the first-order executive tier aimed at one's own actions and their effects. Then, from the second-order reflective tier, chimpanzees (as tool-using manipulators of the external environment) attribute these internal causal inferences about self-action to external events that seem self-generated (e.g., objects that spontaneously fall or are blocked). Channeling Piaget (1974), then, we may say that an ape's inferences about the causes of its own actions are implications, whereas its attempts to explain external events (e.g., so as to predict them) are explications, with both requiring a reflective understanding. They both reflect on the same "logic of action", just differently.

Beyond the intentional agency and instrumental rationality of mammals in general, then, chimpanzees are rational agents who can reflect on their thinking and decision-making metacognitively, using a second-order executive tier of functioning, which also empowers them to experience logically organized causal and intentional relations in the external world. And so, if we humans wish to imagine ourselves as chimpanzees, we might engage in an act of tool use or tool making, for example, employing our causal understanding in preparing and using a stick to pry off the bark off a tree. Or perhaps we might engage in an act of predicting what another person will do when we are competing with them in a concrete situation or just observing them from afar as they go about concrete goal-directed activities. Invoking the continuity assumption, I see no reason to think that our experience would be substantively different from theirs in these situations, assuming, that is, that we can ignore those aspects of our human experience that are not available to chimpanzees. And so let me now be more explicit in specifying exactly what must be ignored.

4 Shared agency and objective and normative experience

Behaviorally, the most important differences between chimpanzees and humans lie in their very different social lives. From hunter-gatherers to contemporary urban dwellers, humans live in much more cooperative social groups than do other apes. Moreover, to function in these especially cooperative social groups, humans have evolved capacities for forming with one another shared agencies to accomplish things that no individual could accomplish on its own, either a joint agency with another individual or a collective agency with the cultural group at large, that operate by “making the individual a sharer or partner in the associated activity so that he feels its success as his success, its failure as his failure“ (Dewey (1916, p. 14). By the heyday of early modern humans some 100,000 years ago, human social groups constituted full-fledged cultures, comprising species-unique cooperative structures such as conventions (including linguistic conventions), norms, and institutions. Coming to maturity in this kind of cooperatively structured environment leads humans to experience the world both objectively and normatively in ways that other apes do not.

To imagine the chimpanzee experiential niche from our human experiential niche, then, we must specify what is involved in viewing the world objectively and normatively as humans but not chimpanzees do. Of course we can never efface this dimension of human experience from all aspects of our lives, but, I will argue, there are activities in which we engage for which it is not operative.

4.1 Objectivity

Chimpanzees do not understand their world in terms of the contrast between subjective points of view and objective reality; they simply experience the world as it appears to them and act accordingly. So how is it that humans have come to view the world in terms of a contrast between subjective and objective perspectives?

The first step, that is, both evolutionarily and ontogenetically, is that individuals collaborate with one another in a new way: they form with one another a joint agency that acts toward a joint goal employing processes of joint attention. In doing so, they do not lose their individuality, but rather it is incorporated into a novel dual-level social structure. On the shared level is the joint goal and the joint attention that the collaborative partners share on situations that are relevant to their pursuit of that joint goal (e.g., an antelope jointly spied in the meadow would be an opportunity for hunting). On the individual level are the individual behavioral roles and perspectives of the partners (e.g., I view the antelope on my side of a river, whereas you view it as across the river). The jointness or sharedness is necessary for the notion of role or perspective – we see “the same thing” just from different perspectives—because without the sharedness we just see different things. Creatures that do not form joint agencies with joint goals and joint attention (capacities for joint intentionality; Tomasello, 2014, 2020a) do not operate with the notion of different perspectives on the same shared thing (in Davidson’s, 2001, terms, they are incapable of triangulation).

The notion of perspective is so important for humans that they have built systems of communication around it. Initially, at this first step, there are the species-unique gestures of pointing and pantomiming. To communicate effectively using such natu-

ral gestures individuals have to take one another's perspective as they seek to align their perspectives in joint attention: I see that you are not attending to something and I wish you to join me in attending to it, or, conversely, I try to discover what you are apparently inviting me to attend to jointly with you (because you are addressing your gesture to me with respect to it). Chimpanzees do not communicate triangularly in this way. They simply act toward another to get him to do what they want him to do directly; there is no joint attention and no individual perspectives involved. Human communication of this type thus relies on (and facilitates) cognitive skills of mental coordination: individuals must simulate one another's perspectives as they attempt to align perspectives in joint attention to relevant situations (see Tomasello, 2018, for a review of evidence). Importantly, this uniquely human form of communication involves recursive mental coordination—she *intends* for me to *know* that there is a mango in this tree – a skill of which chimpanzees are not capable.

The second step, both evolutionarily and ontogenetically, involves adaptations not just to collaborative partners but to the cultural group (i.e., capacities for collective intentionality). Here the sharedness involves the cultural common ground shared among all members of the group as manifest in its conventions, norms, and institutions. Communicatively, this means conventional forms of communication, a.k.a., linguistic communication, which enable individuals to communicate effectively with anyone in the cultural group, even if they have never before met one another. And communicating in a conventional language enables us to jointly attend to mental contents that either of us express in the conventional language (O'Madagain & Tomasello, 2019). For example, if I suggest a joint plan to forage for honey, you may critique the plan, and I may critique your critique; we are jointly attending to, and communicating about, my plan for us. When the topic of our disagreements is my assertion about the world – I assert that the cat is on the mat and you disagree—“space is created” (to use Davidson's, 2001, metaphor) for an understanding that we both cannot be right with regard to the objective situation: one must be objectively right and the other objectively wrong.

In human development, children at around 4 to 5 years of age generalize the notion of perspective into the concept of belief, which contrasts with an objective perspective on things (a kind of perspectiveless perspective; Nagel, 1986). Before this age human infants, like chimpanzees, can track the epistemic states of others, but they do not conceptualize these as perspectives on the same thing that may differ from one another. But at this age children in various experimental paradigms begin to distinguish beliefs from the objective situation, appearance from reality, and different linguistic aspects, all key constituents of the human experiential niche (see Tomasello, 2018, for a review). Moreover, once children understand – and know that others understand – that individual perspectives or beliefs contrast with the objective situation, there arises the need to justify one's expressed belief with reasons. And so young children begin at around this same age to engage in reason-giving discourse in which they negotiate between their own belief and the belief of a discourse partner so as to arrive at an objective perspective on the situation. For acts of reason-giving to be dispositive in this discourse, the reason must make contact with something in the partners' common ground beliefs about the world: the cat must be on the mat because she was on it a few minutes ago and we can still hear her sleeping there. Reasons thus

anchor assertions in common ground beliefs about the world that partners share, and this gives the reasons their normative force: we both should accept the reason on pain of some kind of contradiction (see Koymen & Tomasello, 2020, for a review).

And so human capacities for collaboration and cultural participation, a.k.a., shared intentionality, create for humans a new experiential niche in which subjective beliefs are distinguished from objective situations, and arguments about which beliefs are objectively the case are buttressed by the expression of reasons as anchored in our common ground beliefs about the world. That is to say, human objective and normative rationality operates within a shared space of reasons employing “common standards of correctness and relevance, which relate what I do think to what anyone ought to think” (Sellars, 1963, p. 16). Chimpanzees do not operate in this way because they did not evolve to make their living by collaborating and communicating with others in their cultural group, and so they have no conception of individual perspectives as contrasted with an objective perspective, buttressed by shared reasons.

4.2 Normativity

Chimpanzees also do not understand their world in terms of the contrast between personal preferences and normative standards. They have personal preferences and understand that others do as well, but there is no sense of supra-individual normative standards that carry a kind of objective force. So how is it that humans have come to view the world in terms of this fundamental contrast?

Again, the first step involves individuals collaborating with one another via skills of joint intentionality. To do so individuals must develop especially cooperative ways of relating to others because without a cooperative attitude others will reject them as collaborative partners, and, indeed, they will lose their own sense of cooperative and moral identity. Thus, if you and I are collaborating to catch fish, with you chasing them toward the shore and I netting them, then to be a good collaborative partner each of us must play our role in the way that we mutually understand is needed for us to be successful in reaching our joint goal. We thus have in our personal common ground the ideal way in which each role must be played for collaborative success, these role ideals constituting the most basic and concrete form of socially shared normative standard.

Importantly, the standards are not just instrumental – based on success – but also normative, or even moral, as each partner comes to view the other as equally deserving of respect and resources. The basis for this respect is the sense of equality that develops between collaborative partners: we are both equal causal forces in producing the result and the ideal role standards apply impartially to whoever fulfills the role, even if we were to switch roles. This sense of self-other equivalence underlies a basic sense of recognition respect (Darwall, 2006) that generates a sense of responsibility to one’s partner as equally deserving, and thus a sense of fairness in dividing the spoils of any collaborative efforts. If a partner violates the mutual sense of respect and fairness, the other will object and both will see the objection as legitimate. Partners thus often form a joint commitment in which they, essentially, agree ahead of time that if either partner acts non-cooperatively, the other will call her out and they will then agree further that that rebuke is legitimate and deserved by the transgressor,

even if it is the self who is the transgressor (Gilbert, 2014). Internalizing this interactive nexus, individuals form a sense of responsibility to their (potential) collaborative partners.

Again, in a second step, this scales up to life in a cooperative cultural group. Now, instead of just joint commitments between individuals there are commitments to group-wide social norms by means of which the group regulates the behavior of individuals. Individuals who break social norms are chastised by other members of the group, who protest the individual's behavior on behalf of the group. They join into the collective commitment of the group to their shared social norms almost as co-authors: "we" made up these rules so they are legitimate and we all have an obligation to follow them and even enforce them on others for the good of the group, on pain of a loss of our sense of cooperative identity within the group (so we must apologize or otherwise make an excuse for any transgression). In this case, internalization of the interactive process involved leads individuals to feel a sense not just of responsibility to partners but an obligation to the group or moral community as such (Tomasello, 2020b). And it is important that the group is not just conceptualized as a collection of individuals, but rather as an idealized identity: not just a collection of individuals but "anyone who would be one of us" ("The contrast between 'I' and 'anyone' is essential to rational thought [and so normativity]", says Sellars 1963, p. 16).

As part of this transformation comes a kind of objectification of normativity. In one of the most curious phenomena of the natural world, individuals extend a sense of objectivity to their social-institutional worlds to create what John Searle (1995, 2010) calls social facts and institutional reality. Social facts and institutional reality comprise real and powerful entities such as: husbands and wives with their respective rights and responsibilities (created by the cultural ritual of a marriage ceremony); leaders or chiefs and their rights and responsibilities (created by group consensus and sometimes a ceremony); medicine men and their rights and responsibilities; and so forth. They also can turn otherwise ordinary objects, such as shells or pieces of paper, into culturally potent entities such as money. The phenomenon is that a normal person or object acquires a new status based solely on the deontic powers she is collectively given by the group via some form of collective agreement and recognition, and that agreement is objectified and so becomes part of external reality. Clever as they are, chimpanzees (and human infants) cannot act meaningfully in modern humans' social-institutional world—they do not recognize husbands and presidents and money with their respective deontic powers, nor can they understand scoring a goal in soccer—because they are not capable of conferring normative statuses on otherwise ordinary persons, objects, or actions by collective "agreement" with their cultural compatriots.

And so human capacities for collaboration and cultural participation, a.k.a., shared intentionality, create for humans a new experiential niche in which subjective preferences are distinguished from objective normative standards of right and wrong that everyone who would be one of us are obliged to respect. Chimpanzees do not operate in this way because they did not evolve to make their living by cooperating respectfully with others and obliging themselves to others in their cultural group.

4.3 Shared intentionality and individual psychology

Beyond general great ape reflective and logical (rational) decision-making and thinking, then, humans evolved to form shared agencies among rational individuals based on adaptations for shared intentionality. There is much evidence (reviewed in more detail in Tomasello 2014, 2016, 2019) that great apes have not evolved to operate in this way, neither to collaborate with other individuals in acts of joint intentionality nor to identify and commit to their social group in acts of collective intentionality. This means that if we wish to imagine ourselves as a chimpanzee, then we must recognize first and foremost that their experiential niche lacks such human-specific social structures as joint goals and joint attention, in addition to cultural conventions, norms, and institutions. In addition, we must recognize that because they lack skills of shared intentionality apes operate without the distinction between subjective perspectives or beliefs and the objective situation; they simply take experience as it presents itself to them formatted in terms of situations with underlying causal and intentional relations. Then, similarly but further, we must imagine ourselves operating without the distinction between personal motives or preferences and the (objective) normatively right things to think and do; we must simply operate in terms of the individual goals and preferences of ourselves and others. And, finally, we must imagine ourselves operating in a world devoid of the things that we have created by collective agreements, from money to marriage to governments, not to mention such things as checkmate in the game of chess (i.e., rule games and their constituents).

Philosophers who emphasize the normative dimensions of human experience might very well argue that it is impossible for us to suppress or subtract out or eliminate its objective/normative dimensions, which would make it impossible for us to imagine the experience of chimpanzees. That may be true in many contexts of human activity, including all of those that are embedded in cultural institutions or that operate in the context of cultural norms, including those that govern many aspects of rational and moral activity. Nevertheless, humans also operate in some contexts without those dimensions of experience – precisely because they are not relevant to their activity in those contexts. For example, I proposed above that our experience of using a stick as a tool to pry beneath the bark for termites might be very similar to that of chimpanzees'. Both species conceptualize the objects and events involved in this activity in very similar ways, including the causal relations involved. Of course, if it was suddenly relevant to us, as humans, that the proper way to use the tool was "thus", or if it was suddenly relevant to us that we might be hogging the termites to the detriment of our groupmates unfairly, then of course the normative dimension would begin structuring our experience. In the social domain, when we are observing another individual and focused only on her intentional sensorimotor actions in using a tool, for example, our experience would be similar to that of a chimpanzee. But, again, if it was suddenly relevant that she was using the tool wrongly, or that she believed something false about the termites, then, again, the objective/normative dimension would begin structuring our experience. So I would certainly not argue that we could ever subtract out or annul the normative dimensions of human experience from contexts in which it is relevant; it constitutes the "form of life" within which we are operating in such contexts. But humans operate in some contexts that

are, in a sense, evolutionarily more ancient, in which the objective/normative dimension is simply not operative.

5 Intentionality, rationality, and normativity

The approach I have taken to Nagel's famous question is to infer what certain creatures are capable of experiencing by examining the nature of their actions—specifically the agentic organization of their actions—as determined in experimental situations aimed at just this question. The close connection between action and experience is a central theoretical tenet of classical American pragmatism, and the use of experimental observations to characterize action and experience is a methodological ideal of the paradigm as well. As the first philosophers to use evolutionary biology and psychology (as opposed to physics) as their naturalistic grounding, the early pragmatists had the disadvantage that there did not exist at the time either the theoretical or experimental bases for a true evolutionary psychology. With these bases now in place, we are in a position to make significant progress on the pragmatists' program in a way that they would likely recognize, if not endorse.

A major concern of the pragmatists was to develop shared understandings in the scientific and philosophical communities about key concepts. This is not to be achieved by philosophers adopting scientists' definitions whole cloth nor by philosophers developing their own definitions unilaterally, but rather by philosophers and scientists understanding the empirical research and proposing definitions that (almost) everyone can agree serve (almost) everyone best in focusing and directing further productive investigations. The concepts of intentionality, rationality, and normativity are contentious in philosophy, often in ways that are not productive, precisely because they are often unmoored from behavioral observations. What is needed for more productive debates, with the current case as one example, is constraints on definitions engendered by a commitment to ground those definitions in the currently best scientific understanding of how evolution and psychology work. What I have offered here are admittedly very sketchy proposals for how to think about intentionality, rationality, and normativity in the context of a model of goal-directed action across species.

My proposal for intentionality is to think of it most basically as the agent's goal-directed action supervised by an executive tier of functioning that can survey means and ends and make informed decisions, with the more mental side (the 'other' meaning of intentionality) coming from the need to intentionally attend from the executive tier both to goal-relevant situations in the world and to the agent's own actions. Agentic action is focused both on imagined results and on how they are achieved, and this is the foundation of intentional agency and its associated experiential niche. Thus, both the species' ecological/experiential niche in general and the individual's focus of attention at any given moment are structured by the goal-directed actions to be performed. Chimpanzees, as all mammals including humans, operate as intentional agents in this sense. The human case is distinguished by unique forms of *shared* intentionality, which create an experiential niche structured by the differentiation of subjective perspectives or beliefs from the objective situation at which they aim.

My proposal for what I have called reflective rationality is to think of it as deriving from a second-order executive tier of functioning in which the agent reflects on its own intentional decision-making in order to diagnose potential problems and intervene in them. Reflecting on the mental processes involved in intentional decision-making then provides the requisite concepts for experiencing the world in terms of the underlying causal and intentional relations that give it its rational (logical) coherence. This way of operating is characteristic of chimpanzees and other great apes and represents a significant step beyond simple instrumental (economic) rationality, in which organisms simply pursue their goals intelligently and efficiently. But it is not the kind of normative rationality with which humans operate. Again, human uniqueness derives from processes of *shared* intentionality that give rational coherence to humans' joint and collective agencies through collectively created and constituted norms of rational and moral action and thought. Mammals think and make decisions via an instrumental rationality; great apes think and make decisions via a reflective rationality; humans think and make decisions via a normative rationality.

And my proposal for how to think about normativity in naturalistic terms is to conceptualize it basically as a shared agent's self-regulation of its own collective actions. During a collaboration, each participant makes judgments (from the collective point of view) about what each participant should be thinking and doing for the benefit of the partnership or group. Normative judgments have to do with how "we" judge both other individuals in the group and ourselves, with individuals internalizing and objectifying the resulting norms. Thus, individuals participating in a shared agency not only chastise their partner for non-cooperative behavior but also expect to be chastised themselves if they behave non-cooperatively, and the chastising is considered legitimate because it is coming from the shared agent "we" (such that the transgressor feels the need to make an excuse or apologize or feel guilty – which chimpanzees do not do). Internalization of this interactive process leads individuals to a sense of responsibility or obligation to their partner(s) or group. This process constitutes the normative self-regulation of a socially shared agency that derives its normative force from the fact that all cooperating individuals feel together that the normative ideals of the cooperative body transcend any individual opinions or preferences. Indeed, once individuals identify with the culture's ideal way of doing things – and so the norm is held not by a group of individuals but by "anyone who would be one of us" – the social norms begin to be seen as reflecting truly objective values.

The overall proposal is thus that, regardless of whether these particular definitional proposals are adequate, their framing within a scientifically based model of agentive action provides all who would use these concepts with some much-needed empirical constraints, indeed guides, to help in coming to a consensus about them. If the many difficult questions raised by people focused on Nagel's original question concerning phenomenological consciousness could possibly be framed in terms of specific research findings with specific species, it is possible that this would lead to greater conceptual and empirical progress as well.

6 A modern naturalistic pragmatism

It is a given that a pragmatically oriented philosophy should take as its raw material the concepts, methods, and results of the natural sciences. But which natural sciences? Evolutionary biology and psychology for sure, as is becoming ever more common in the philosophies of psychology and agency. But, I would argue, we need versions that involve comparisons across space and time, which is much less common. Thus, I have focused here on evolutionary connections among species via homologies, but also enlightening are commonalities in ecology-psychology relations across species, that is, based on parallel evolution or analogies (e.g., as in Godfrey-Smith, 2016, 2020). Also possible, if we are interested only in human experience, is cultural anthropologists' observations comparing across historically related cultures, which differ from one another in their cultural practices, their rational and moral norms, and their languages. Still a third possibility is comparisons across different stages of human ontogeny, for example in the domain of human language, from prelinguistic gesturing to simple one-word utterances to full-blown grammatically structured propositional language. Investigations of these types should make for a happy and co-equal marriage between behavioral/cognitive scientists and philosophers, as the empirical disciplines associated with these comparisons could use some conceptual guidance.

Importantly, explanations for any differences of psychology found through such comparisons – including those involving both agency and experience—always take the form of historical explanation. Similarities and differences among species are explained via evolution by means of natural selection, those among cultures via cultural-historical processes, and those across ages in ontogeny via maturational and learning (epigenetic) processes. This genetic/historical method of explanation has a solid history in philosophy from the Enlightenment on, from the mythical but explanatory stories of Hobbes and Rousseau to Sellars' myth of Jones. And one could argue that historical explanations in general are special instances of Grice's preferred strategy of building things up conceptually from simpler to more complex constituents and relations (as elaborated in Bratman's, 2014, account of shared agency). But a commitment to naturalism would replace these various explanatory stories, myths, and conceptual analyses, with actual empirical data on the evolution, history, and development of whatever human phenomena are of interest to philosophers.

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References

- Andrews, K., & Beck, J. (2018). *The Routledge handbook a philosophy of animal minds*. New York: Routledge
- Baker, C. L., Saxe, R., & Tenenbaum, J. B. (2009). Action understanding as inverse planning. *Cognition*, 113(3), 329–349
- Bermudez, J. (2003). *Thinking without words*. Oxford University Press
- Blaser, R., & Ginchansky, R. (2012). Route selection by rats and humans in a navigational traveling salesman problem. *Animal Cognition*, 15, 239–250
- Bohn, M., Allritz, M., Call, J., & Völter, C. J. (2017). Information seeking about tool properties in great apes. *Scientific Reports*, 7(1), 1–6
- Brom, R. (1994). *Making it explicit: Reasoning, representing, and discursive commitment*. Cambridge: Harvard University Press
- Bratman, M. E. (1987). *Intention, plans and practical reason*. Cambridge, MA: Harvard University Press
- Bratman, M. (2014). *Shared agency: A planning theory of acting together*. New York: Oxford University Press
- Buttelmann, D., Carpenter, M., Call, J., & Tomasello, M. (2007). Enculturated apes imitate rationally. *Developmental Science*, 10, 31–38
- Call, J. (2004). Inferences about the location of food in the great apes. *Journal of Comparative Psychology*, 118(2), 232–241
- Call, J. (2010). Do apes know that they could be wrong? *Animal Cognition*, 13(5), 689–700
- Call, J., & Carpenter, M. (2001). Do apes and children know what they have seen? *Animal Cognition*, 3(4), 207–220
- Carruthers, P. (2005). *Consciousness: essays from a higher-order perspective*. Oxford University Press
- Chow, P., Leaver, L., Wang, M., & Lea, S. (2015). Serial reversal learning in grey squirrels: learning efficiency as a function of learning and change of tactics. *Journal of Experimental Psychology: Animal Learning and Cognition*, 41, 343–353
- Collingwood, R. G. (1940). *Essay on metaphysics*. London: Oxford University Press
- Darwall, S. (2006). *The second-person standpoint: Respect, morality, and accountability*. Cambridge, MA: Harvard University Press
- Davidson, D. (2001). *Subjective, Intersubjective, Objective*. Oxford University Press
- Dewey, J. (1896). The reflex arc concept in psychology. *Psychological Review*, 3(4), 357–370
- Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan
- Dickinson, A. (2001). Causal learning: An associative analysis (The 28th Bartlett Memorial Lecture). *Quarterly Journal of Experimental Psychology*, 54B, 3–25
- de Waal, F. B. M. (1999). Anthropomorphism and anthropodenial: Consistency in our thinking about humans and other animals. *Philosophical Topics*, 27, 255–280
- Gershman, S. J., Horvitz, E. J., & Tenenbaum, J. B. (2015). Computational rationality: A converging paradigm for intelligence in brains, minds, and machines. *Science*, 349, 273–278
- Gigerenzer, G., Hertwig, R., & Pachur, T. (2011). *Heuristics: The foundation of adaptive behavior*. Oxford: Oxford University Press
- Gilbert, M. (2014). *Joint commitment: How we make the social world*. New York: Oxford University Press
- Godfrey-Smith, P. (2016). *Other minds: The octopus, the sea, and the deep origins of consciousness*. New York: Farrar, Straus and Giroux
- Godfrey-Smith, P. (2020). *Metazoa: Animal life and the birth of the mind*. New York: Farrar, Straus and Giroux
- Gordon, R. (in press). Simulation, predictive coding, and the shared world. In K. Ochsner, & M. Gilead (Eds.), *The neural basis of mentalizing*. Springer
- Graziano, M. S. (2019). *Rethinking consciousness*. New York: Norton
- Hanus, D., & Call, J. (2008). Chimpanzees infer the location of a reward on the basis of the effect of its weight. *Current Biology*, 18(9), R370–R372
- Hanus, D., & Call, J. (2011). Chimpanzee problem-solving: Contrasting the use of causal and arbitrary cues. *Animal Cognition*, 14(6), 871–878
- Hare, B., Call, J., & Tomasello, M. (2001). Do chimpanzees know what conspecifics know? *Animal Behaviour*, 61(1), 139–151

- Hare, B., Call, J., Agnetta, B., & Tomasello, M. (2000). Chimpanzees know what conspecifics do and do not see. *Animal Behaviour*, 59, 771–785
- Herrmann, E., Misch, A., Hernandez-Lloreda, V., & Tomasello, M. (2015). Uniquely human self-control begins at school age. *Developmental Science*, 18(6), 979–993
- Hume, D. (1739/40). *A Treatise of Human Nature*. Oxford: Clarendon Press
- Hurley, S., & Nudds, M. (2006). *Rational animals?*. Oxford: Oxford University press
- James, W. (1890). *Principles of psychology* (1 vol.). New York: Holt
- Kano, F., Krupenye, C., Hirata, S., Tomonaga, M., & Call, J. (2019). Great apes use self-experience to anticipate an agent's action in a false-belief test. *Proceedings of the National Academy of Sciences*, 116(42), 20904–20909
- Karg, K., Schmelz, M., Call, J., & Tomasello, M. (2015). The goggles experiment: Can chimpanzees use self-experience to infer what a competitor can see? *Animal Behaviour*, 105, 211–221
- Koymen, B., & Tomasello, M. (2020). The early ontogeny of reason-giving. *Child Development Perspectives*, 14, 215–220
- Legg, C., & Hookway, C. (2020). Pragmatism. *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition)
- McDowell, J. (1994). *Mind and world*. Cambridge: Harvard University Press
- Mead, G. H. (1934). *Mind, self, and society*. Chicago: University of Chicago Press
- Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York: Holt & Co.
- Mulcahy, N. J., & Call, J. (2006). Apes save tools for future use. *Science*, 312, 1038–1040
- Nagel, T. (1974). What is it like to be a bat? *Philosophical Review*, 83, 435–450
- Okrent, M. (2007). *Rational animals: The teleological roots of intentionality*. Athens: Ohio University Press
- O'Madagain, C., & Tomasello, M. (2019). Joint attention to mental content and the social origin of reasoning. *Synthese*, 1–22
- Nagel, T. (1986). *The view from nowhere*. Oxford: Oxford University Press
- Piaget, J. (1952). *The origins of intelligence in children*. New York: Norton
- Piaget, J. (1974). *Understanding causality*. New York: Norton
- Povinelli, D. J., & Dunphy-Lelii, S. (2001). Do chimpanzees seek explanations? Preliminary comparative investigations. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale*, 55(2), 185
- Schmelz, M., Call, J., & Tomasello, M. (2013). Chimpanzees predict that a competitor's preference will match their own. *Biology Letters*, 9(1), 20120829
- Searle, J. (1995). *The construction of social reality*. New York: The Free Press
- Searle, J. (2010). *Making the social world*. Oxford: Oxford University Press
- Sellars, W. (1963). : Philosophy and the scientific image of man. In: *Science, perception and reality*. Ed. by Sellars, London: Routledge, pp. 1–40
- Shea, N., & Frith, C. (2019). The global workspace needs metacognition. *Trends in Cognitive Sciences*, 23, 560–571
- Templer, V. L., Lee, K. A., & Preston, A. J. (2017). Rats know when they remember: Transfer of metacognitive responding across odor-based delayed match-to-sample tests. *Animal Cognition*, 20(5), 891–906
- Tomasello, M. (2014). *A natural history of human thinking*. Cambridge: Harvard University Press
- Tomasello, M. (2016). *A natural history of human morality*. Cambridge: Harvard University Press
- Tomasello, M. (2018). How children come to understand false beliefs: A shared intentionality account. *Proceedings of the National Academy of Sciences*, 115(34), 8491–8498
- Tomasello, M. (2019). *Becoming human: A theory of ontogeny*. Cambridge: Harvard University Press
- Tomasello, M. (2020a). The role of roles in uniquely human cognition and sociality. *Journal for the Theory of Social Behaviour*, 50, 2–19
- Tomasello, M. (2020b). The moral psychology of obligation. Target article in *Behavioral and Brain Sciences*, 43, e56: 1–58
- Tomasello, M. (2022). *The evolution of agency: From lizards to humans*. Cambridge: MIT Press
- von Uexküll, J. (1934/2010). A foray into the worlds of animals and humans: With a theory of meaning. (J. D. O'Neil, Trans.) Minneapolis: University of Minnesota Press
- Woodward, J. (2003). *Making things happen. A theory of causal explanation*. Oxford: Oxford University Press

Yin, H. H., & Knowlton, B. J. (2006). The role of the basal ganglia in habit formation. *Nature Reviews Neuroscience*, 7(6), 464–476

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