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## Deep history and beyond: a reply to commentators

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### ABSTRACT

The commentaries by Ren, de Carvalho, Gabriel, Reber and Baluška raise interesting and timely questions about the views I expressed in *The Deep History of Ourselves*. I begin my response with an Overview of my perspective, and how it has changed in the three years since publication. This is important since some of the commentators' concerns may be assuaged by some of these points. Other specific issues raised by each commentator are addressed separately. I greatly appreciate the time and effort they put into their comments on *The Deep History of Ourselves*.

### ARTICLE HISTORY

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### Overview: beyond deep history

In *Deep History*, I argued that strong conclusions about animal consciousness are methodologically out of reach. One cannot make a claim about a given behavior being consciously controlled in humans without meeting strict criteria that rule out non-conscious alternatives (and vice versa for claims about non-conscious control). By contrast, in studies of animal consciousness, the standards are considerably looser. This is in some sense necessary because we lack methods that can rigorously evaluate the distinction between conscious and non-conscious behavioral control in non-verbal organisms.

I am not alone in taking a cautious approach. For example, the pioneering ethologist Nico Tinbergen said that fear, hunger, and the like can only be known through human introspection, and when we project these onto other animals, we are merely guessing about possible subjective experiences (Tinbergen, 1951). He was not denying that other animals have subjective experiences. Instead, he was simply urging caution in making such claims.

A more contemporary perspective comes from studies of episodic memory. Unlike in humans, in animals consciously experienced episodic memories and mental time travel cannot be measured. As a result, the term “episodic-like” memory is typically used (Clayton et al., 2001). A similar

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approach that recognizes the limitations that exist would be useful in other areas of research on animal consciousness. I am not opposed to speculation about animal consciousness. I just think the difference between speculation and fact needs to be more explicitly acknowledged in this area.

Shortly after completing *Deep History*, I wrote four short essays in *Current Biology* that allowed me to begin to patch some conceptual holes in my perspective, and work on some new ideas. Particularly relevant here was an article titled, “What Emotions Might Be Like in Other Animals” (LeDoux, 2021b). In it, I proposed a new, empirically-based, reverse engineering, approach to conceptualizing and speculating about animal consciousness, especially animal emotions. This approach, which I will describe below, gave me a way to see how human emotions *might* have evolved from processes in other mammals.

This is of note given that toward the end of *Deep History*, I made two controversial claims. One was that cognition predated emotion in evolution – that emotional evolution depended on the use of internal representations. The other was that emotions are uniquely human exaptations. I still subscribe to the idea that emotions are cognitive interpretations of situations, and hence that cognition was an evolutionary antecedent to emotions. But I no longer argue that emotions are uniquely human. Instead, I now see human emotions as unique modifications of processes that may be shared with at least other primates and other mammals (LeDoux, 2021a).

When I say “emotions” I am referring to conscious experiences, not behavioral, physiological, or other objectively measurable responses. My work has led me to conclude that the objective responses are loosely correlated with, but not consequences of subjectively experienced feeling. My view is that the emotion is the feeling, and the responses are separate, parallel, but interacting, consequences initiated by the same external trigger stimulus (LeDoux, 2020).

The psychological basis of my proposal about animal emotions was built on two bodies of knowledge. One is the Higher-Order Theory of Consciousness, which assumes that consciousness results from higher-order representation of lower order information Rosenthal (2005); Lau and Rosenthal (2011); LeDoux and Brown (2017); Brown et al. (2019). The other was Endel Tulving’s partition of mental state consciousness into auto-noetic (explicit self-awareness of one’s existence over time), noetic (explicit awareness of facts and concepts about the world or one’s self), and anoetic (implicit awareness of the world or one’s body) (Tulving, 1983, 2005). Each was said to be related to a different kind of memory: auto-noetic to episodic memory; noetic to semantic memory, and anoetic to procedural memory. The three states, therefore, provide pre-conscious proxies that can be studied in non-human species to assess what kinds of conscious states they *might* have, given how their brains are similar to and different from

ours. Because each involves a cognitive re-representation of a particular kind of lower-order memory state (Metcalf & Son et al., 2012), Tulving's model is a kind of higher-order theory. If we had a better understanding of the brain circuits underlying Tulving's three kinds of consciousness in humans, it might be possible to use similarities and differences between our brains and the brains of other mammals to speculate about which kinds of consciousness might be present in the latter. As a starting point, I noted that anoetic consciousness dominates in non-primate mammals, that primates added noetic consciousness, and only humans have auto-noetic consciousness.

While I had used Tulving's partitions in *Deep History*, I focused on auto-noetic and noetic consciousness. The breakthrough for me came when, in the process of writing the *Current Biology* article on animal consciousness (LeDoux, 2021b), I realized the importance of anoetic consciousness in humans. And that led me to see how anoesis might be a link to emotions in non-human primates and non-primate mammals.

Jaak Panksepp and I have often been viewed as having polar opposite views about emotions. The fact that we both used Tulving's scheme to conceptualize emotions provided a way to lay out exactly what our differences were. We were in good agreement about auto-noetic and noetic conscious states – that cognitive states are the primary kinds of explicit conscious experiences that humans have. What we differed on was what anoetic states are, how they relate to emotions, and how they are experienced.

For Panksepp, anoetic states are the dominant states of emotional conscious experience in mammals. Humans, he said, are seldom explicitly aware of these states because they are overshadowed by cognitive states of consciousness (noetic and auto-noetic states) (Panksepp, 1998), with which I totally agree. Marie Vandekerckhove and Panksepp (2011), suggested that anoetic states may be the “fringe conscious” states that William James talked about as giving our explicit conscious experiences warmth, intimacy and familiarity, and might be what allows us to know that our explicit (noetic and auto-noetic) conscious states are ours (Vandekerckhove & Panksepp, 2011). I also agree with this.

Here is where we differed. For Vandekerckhove and Panksepp, primitive, first-order anoetic conscious emotions emerge directly from subcortical limbic system areas. But for me, these first-order subcortical states must be cognitively re-represented via prefrontal cortex circuits to be experienced anoetically. And how areas of the prefrontal cortex do this re-representation in humans, in other primates, and in other mammals is key to my “what emotions might be like in other animals” idea. Non-primate mammals only have medial agranular PFC and therefore lack the capacity of primates to

use granular PFC for more complex representations. And humans have components of granular PFC that are lacking in other primates (Preuss & Wise, 2022), which may account for our cognitive and conscious differences.

The question of whether conscious emotions are products of subcortical circuits shared by all mammals, as Panksepp said, or are also dependent upon cortical circuits that differ across mammals, is of more than mere academic interest, as the implications of the subcortical view have ramified into daily life. For example, the dominant idea in the treatment “mental” disorders in humans has, since at least the 1950s, been that because disordered behavioral control circuits inherited from mammalian ancestors account for debilitating fear and anxiety in people, drugs that make rodents less timid will relieve people from their subjective torment. This approach has resulted in decades of disappointing treatments, such that by 2010 pharmaceutical companies had started reducing efforts in mental health research (Hyman, 2013; Miller, 2010). We can learn things about how to control behavioral and physiological symptoms in humans through studies of animals, but such studies cannot, by themselves, tell us how to make people feel better subjectively. We have to put the mental back into mental disorders (Taschereau-Dumouchel et al., 2022).

### Specific responses individual commentators

**Emotion, Autooiesis and Self (Songyao Ren).** Ren raises some interesting high-level conceptual issues about the role of episodic memory in autooietic conscious experiences. She suggests that my view does not capture the nature of existential emotions, which represent facts about human conditions in a general, semantic sense, rather than in an episodic fashion.

An external trigger stimulus can, secondary to sensory processing, activate “semanticized” memories, which are often schemas. But mental states are dynamic, and schema, once activated, become part of the mental model that underlies autooietic awareness. Once the autooietic mental model is activated, the self, by definition, is part of the experience, regardless of what triggered the experience. Therefore, existential dread about the meaninglessness of “one’s life” may be initiated as a mere factual thought, but in short, order can morph into a self-riddled autooietic state, since dread is about “one’s life” is, in the final analysis, about “one’s self.”

A clarification about episodic memory might be helpful, as there is some confusion in the literature about this. The traditional way to think about episodic memory was as an archive of one’s personal past. But a more contemporary idea is that episodic memory allows us to make sense of not just the past, but also the present and future through constructively generating our past, present, and possible future through mental simulations, or

imagination (Schacter & Addis, 2021; Suddendorf & Redshaw, 2013 ; Robin and Moscovitch, 2014). As put by György Buzsáki (2022), episodic memory functions like a search engine that we use to construct the past and future. Hence, Ren's concern about existential consciousness can't involve auto-noesis and self because past episodic memories are not involved is not as pressing an issue as it might seem since we episodically construct the present and future as well.

Another issue raised by Ren is that my focus on self-schemas overlooks emotions that carry one away from their goals. But if self is nothing more than a narrative that is continually in flux (Einstein and Flanagan (2003); Bruner, 1994; Gallagher (2013), what one cares about (is emotional about) is not a stable state. For example, my long-term goal may be to eat healthy food, but I can also narrate a rationalization that allows a rich dessert to be my momentary goal.

**How Shallow Is Fear? (Felipe Nogueira de Carvalho).** de Carvalho rejects the point I made in *Deep History* about emotions being uniquely human, and instead argues that they may be present in any creature with the right kinds of skills, which, for him, are social skills required for affective enactment. As I noted above in the overview section, "Beyond *Deep History*", I have moved away from the idea that emotions are uniquely human, and replaced it with the idea that human emotions may be unique modifications of processes shared with primates and other mammals.

As I noted in the response to Ren, human emotions are an amalgam of auto-noetic, noetic, and anoetic processes that differentiate human (auto-noetic), primate (noetic), and other mammals (anoetic). Also, auto-noetic processes subsume the noetic, and these overshadow anoetic component (Vandekerckhove & Panksepp, 2011). In light of this, I see a bridge to phenomena that de Carvalho labels as affective enactment, since many of the cognitive processes and cortical areas likely involved are components of my current framework.

Where we differ most is probably on the question of an internalist versus externalist perspective about emotions. His affective enactment model takes an embodied mind approach to the social externalization of emotions. He characterizes me as being an internalist, since I emphasize auto-noetic consciousness. Many of the same processes will be involved in the two perspectives, and it may all boil down to how one defines emotion. Is it a personal subjective experience that can involve a social component, or is it crucially a social interaction? Given that my model proposes that emotions are socially and culturally constructed, and his model includes subjective conscious emotion, there may be more overlap that might seem at first. But the fact is that one can experience emotion independent of a momentary social context. There need be no social interaction to feel fear of a rattlesnake at your feet.

One final point: de Carvalho's concern about me over-emphasizing language in emotion seems misconstrued. As I pointed out in one of the recent *Current Biology* articles I mentioned earlier, "emotion labels are not required to feel emotionally aroused, but are required to feel the emotion named by the label. A distressed young child, lacking specific emotion words cannot experience herself as being in a state that an older child experiences as fear when her mental model, drawing upon her emotion and self-schemas, conceptualizes her experience that way . . . even in adults the non-conscious underpinnings of emotions are not always precise enough to produce an experience that is clearly identified with a common emotion word. One may feel uncomfortable, concerned, or distressed in a situation, and not progress to something more specific. But as the situation unfolds and more information is collected, it is also possible that a vague feeling may turn into one labeled and experienced as fear, which might, with additional information, morph into anger or jealousy, or to relief (LeDoux, 2020).

**The Deep History of Affect and Consciousness (Rami Gabriel).** Early in his critique, Gabriel points out that if one adopts a connection between cognition and internal representation, Deep History is compelling, as "it expertly synthesizes some of the best work of the last fifty years." But he questions the entire cognitive enterprise, stating, "The cognitive sciences suffer from their own methodologism, viz., determining whether a creature has internal representations consists of positing an accordance between models of information processing functions and modeling behavior." Gabriel is thus battling for the philosophical soul of psychology. I don't feel that it is my place to address this global issue, and will, instead, focus on some of his more specific critiques that relate directly to me.

Gabriel is critical of my efforts to curtail anthropomorphism in the study of emotion, noting that I misrepresented Darwin. He defends Darwin by saying that he (Darwin) was aware of reflexes. I fail to see how that means he was not anthropomorphic about animal minds. Much has been written about Darwin's foray into psychology (Keller, 1973; Knoll et al., 1997; Penn et al., 2008). Elizabeth Knoll, for example, noted that Darwin justified his appeal to human-like emotions in animals by saying it was "a more cheerful view" than one based on the assumption that humans have animal-like qualities. Crucially, he admitted his motivation. According to Knoll, his theory of evolution was not being well received and he thought that imbuing animals with human mental qualities might win him fans amongst the pet-fancying Victor populace. The numerous examples of anthropomorphic analogies in his book, according to Knoll, did the trick.

Gabriel also says that I misrepresented Jaak Pankseep, noting that he (Pankseep) used not just behavior, but also neuroscience and philosophy,



to defend his anthropomorphism. Again, I fail to see how this makes anthropomorphism legitimate as a scientific strategy.

Gabriel also calls on Pankseep's friend, Mark Solms', to also challenge my views. Solms defends Pankseep against the likes of me in his book, *The Hidden Spring* (Solms, 2022). In my review of the book, I respond to Solms critique of my views (LeDoux, 2022).

Gabriel also notes, "LeDoux's focus on cortical factors underplays the role of the Reticular Activating System (RAS) and specifically, of the Periaqueductal Gray (PAG) in arousal and as the endpoint of basic survival circuits in the midbrain . . ." The processes Gabriel refers to underlie what is referred to as "creature consciousness". All animals possess creature consciousness by virtue of having a nervous system, being alive, and being responsive to external stimulation. It is generally thought that creature consciousness is necessary but not sufficient for mental state consciousness (Rosenthal, 2005). The extra stuff that goes beyond creature consciousness is what theories of mental state consciousness are about, including global workspace theory, local recurrency theory, higher-order theory, and so forth.

About arousal, Gabriel also notes: "To allow for an emphasis upon representations and linguistic concepts, this neuroanatomical and functional data is left out of LeDoux's cortico-centric theory of emotions." This is not completely correct. I did mention physiological Arousal in *Deep History*, and, in general, physiological arousal plays a key role in my model as a major part of the global organismic states that results from survival circuit activation (LeDoux, 2012, 2014, 2022).

Gabriel proposes that "A more parsimonious approach to the evolution of consciousness, in line with this literature, would place sentience lower in the brain. We could then characterize human consciousness in relation to cortical functions, culture, and language without having to deny that emotions and consciousness are functional aspects of mind for non-human mammals." In response, I say that creature consciousness depends on these "lower" brain regions. And to the extent that creature consciousness is necessary for mental state consciousness, then these "lower" areas make serviceable contributions to mental state consciousness. But also, as I noted above in the section "Beyond Deep History", my ideas about what emotions might be like in other animals clearly include subcortical areas as lower-order components that, when cognitively represented in mesocortex, underlie primitive anoetic conscious states. In other words, subcortical areas contribute, but are not the sole determinant of subjective feelings, at least in my scheme.

Like most if not all views on these matters, my views are hypothetical. But some of Gabriel's concerns may be assuaged by my more recent writings mentioned above, especially my recalibration of what emotions might be



like in other animals. But I suspect he would still not be completely satisfied since he is against cognitive representation, which I maintain are key to mental state consciousness. But as I said at the beginning, his concern about representations is not just a debate with me. It is with the entire field of cognitive science. Similarly, his distaste for my cultural view of emotions extends well beyond my particular approach, as the cultural variability in emotions is a vibrant topic [see LeDoux (2019) and LeDoux (2020)].

**Where Minds Begin (Arthur Reber and František Baluška).** Arthur Reber (2018), like me, wrote a book about the history of life. In it, he emphasized that life and sentience are co-terminus – that “life without subjectivity, feeling, without valenced perception, without the capacity to learn and lay down memories would have been an evolutionary dead-end.” Clarifying, in their commentary, Reber and Baluška note: “We recognize the unique forms of mentation that distinguish humans from other species but we do so in a framework that emphasizes continuity, where human cognitive processes lie at a pole on the spectrum of forms of sentience, where consciousness denotes a continuum of subjectivity, awareness — and not a mental state that only (or mainly) humans are privy to.”

In calling upon “subjectivity” and “feeling” to account for what cells do to stay alive, Reber and Baluška hope to establish a seamless connection between unicellular sentience and animal, including human, consciousness. In other words, they view sentience and human consciousness as “tokens” of a singular “type”. It’s an interesting idea. And in a sense, it might be viewed as instantiating a version of panpsychist consciousness in living things – that is, tokens that exist as part of a consciousness type that are present throughout the physical universe, including in living things. But neither panpsychism nor cellular consciousness capture what interests me about human consciousness – its ability to know from our present perspective that we existed in the past and will exist for some undetermined but limited time in the future.

Reber and Baluška suggest that embracing their view wouldn’t require much of a change in my view. Given that I have found ways to extend my speculations to other mammals, it might seem natural for me to keep on going deeper and deeper – why not propose that anoetic states might be a kind of sentience that is present throughout life? But I resist that temptation, since my view requires a kind of cognitive re-representation that I think is limited to warm-blooded animal – mammals and birds. Others have proposed cognition in non-mammalian vertebrates and protostome invertebrates, and Reber and Baluška, of course, in single cells. In most such cases, cognition means complex behavior. I prefer a narrower definition—one based on internal representations that can be used to control behavior in ways that do not depend on external stimuli.

In *Naming the Mind*, Kurt Danziger reminds us that people long ago invented psychological words to categorize and talk about things important

in their lives (Danziger, 1997). Just because we have words (thoughts, emotions, consciousness) that we use to talk about our own, or others', mental states and behaviors, does not mean that the words reflect natural kinds that have evolved as specific mechanisms and are shared widely in nature.

Given that I am trying to understand human mental state consciousness, I think that focusing on our relation with other primates and other mammals is roughly where I want to be, evolutionarily speaking. I have no problem with others speculating about consciousness in bees, flies, octopus, protozoa, or bacteria. But I think it would be useful if they used a term such as “creature consciousness” when doing so, as that might avoid some of confusion in the literature about what is meant when the term “consciousness” is used. I think the way that Reber and Baluška's use sentience is an effort in that direction. With this more limited notion of sentience as creature consciousness one could make a much stronger case for a deep evolutionary history of sentience without getting tangled up with the more difficult issues that have to be tackled to establish mental states. But that might be a bridge too far. If so, it seems we have to come back to the question of how can we measure mental state sentience in protostomes and microbes without calling upon something like panpsychism?

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The commentaries by [names removed for review] raise interesting and timely questions about the views I expressed in *The Deep History of Ourselves*. I begin my response with an Overview of my perspective, and how it has changed in the three years since publication. This is important since some of the commentators' concerns may be assuaged by some of these points. Other specific issues raised by each commentator are addressed separately. I greatly appreciate the time and effort they put into their comments on *The Deep History of Ourselves*.

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