



## Consciousness, the affectome, and human life

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### ABSTRACT

I have been working on interactions between conscious and non-conscious processes since the late 1970s. In this commentary, I offer a perspective on conscious/non-conscious interactions that might be a useful adjunct to the Human Affectome Project as it evolves.

Daniela Schiller, Alessandra Yu, Leroy Lowe, and their many co-authors are to be congratulated for their impressive, wide-ranging overview of the 'human affectome'. They have made an important and valuable contribution to the field. In articulating their fundamental assumptions about what underlies affective phenomenon, they progress from the broadest purpose of an organism (to ensure viability) to one of the most important functions of the human brain (consciousness). By acknowledging that in humans, and likely also in some other animals, consciousness is fundamental to affective phenomena, the human affectome puts conscious and non-conscious affective processes within one framework.

I have been working on interactions between conscious and non-conscious processes since the late 1970s. Below I will briefly summarize how I have approached this topic and how, in my most recent book, *The Four Realms of Existence*, I developed a new way of thinking about these interrelations. This perspective might be a useful adjunct to the Human Affectome Project as it evolves.

### 1. Background

I began my career as a scientist studying consciousness in split-brain patients as a graduate student in the 1970s (LeDoux et al., 1977; Gazzaniga and LeDoux, 1978). One of the conclusions from my dissertation was that, despite possessing a variety of brain systems that control our behavior non-consciously, and despite having no real access to these non-conscious processes, we humans protect our sense of mental unity by non-consciously generating interpretations, explanations, confabulations, rationalizations, stories, narrations, or whatever you want to call them (I'll call them narrations here) that make our behavior seem

consistent with our conscious beliefs, attitudes, thoughts, and feelings.

In reaching this conclusion, my mentor, Mike Gazzaniga, and I borrowed from work in social psychology, especially Festinger's theory of cognitive dissonance (Festinger, 1957) and Schachter and Singer's cognitive theory of emotion (1962). Specifically, we proposed that we use the narrations to reduce the dissonance that results when we observe our body behaving non-consciously. Further, we hypothesized that non-conscious emotional behaviors might be the kinds of responses that demand such dissonance-reducing narratives.

### 2. Emotional behavior and emotional consciousness

For the next phase of my career, I decided to research the brain mechanisms of emotional behavior (LeDoux, 1996). Since techniques for studying the human brain were limited at the time, I turned to rats as experimental subjects, assuming that circuits involved in controlling emotional behaviors are shared across mammals. Therefore, such emotional behaviors could be studied in rats, even if research on emotional consciousness was out of reach in them. Ever since, I have made my living doing this research, but pursued my passion, emotional consciousness, in review articles and books.

The trajectory of my work eventually led me to conclude that the essence of an emotion is the conscious emotional experience (LeDoux, 2012), and that the various other processes labeled as 'emotional' or 'affective' are distinct evolutionarily, and only contribute to emotional consciousness indirectly. I argued that progress in understanding emotion was being hampered by the conflation of these two distinct brain activities. And so long as we use the same word, 'emotion' to describe both, we will continue to go around in circles (LeDoux, 2014;

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LeDoux and Pine, 2016).

For example, researchers, me included, have claimed to be able to use freezing or avoidance responses, or changes in heart rate or skin conductance, as measures of fear. Several factors suggest that this is problematic. One is that the correlation between so-called fear responses and the mental state of fear are weaker than often presumed (Taschereau-Dumouchel, et al., 2022). Another is that the mental state of fear can even exist in the absence of the responses (Feinstein, et al., 2022). A third is that stimuli presented subliminally to humans elicit heart rate and skin condition responses, despite the fact that the person has no conscious awareness of the stimulus and does not feel 'fear' (LeDoux, 2017). If fear is the cause of the responses, none of this should be the case.

One of the main justifications of this work on fear responses is to understand and treat disorders related to fear and anxiety. Yet, despite decades and decades of research, the effort has been openly recognized by researchers, clinicians, and pharmaceutical companies as 'disappointing' at best (Miller, 2010; LeDoux and Pine, 2016; Taschereau-Dumouchel, et al., 2022). I believe the reason for this state of affairs is because of the false premise that drugs that alter behavioral and physiological responses in animals will effectively treat mental anguish. Not surprisingly, the medications are more effective in treating behavioral and physiological symptoms (avoidance and hyper-arousal). As a result, people continue to suffer from their subjective feelings of fear and anxiety.

The problem, I believe, boils down to sloppy use of language. Namely, the use of mental state words like fear to describe both the mental state and the behavioral and physiological responses that co-occur with the mental state (LeDoux, 2014; LeDoux, 2017). There would be more clarity in the field if mental state words were only used to refer to mental states (makes sense, right?) and other labels were used for the behavioral and physiological responses that co-occur with the mental state. In the area of fear, for example, we already have the words in place—defensive reactions. These go back to the beginning of life. In animals, the circuits that control defensive response are only indirectly related to the circuits that construct conscious feelings of fear.

### 3. Separating conscious and non-conscious processes

We have to use behavior to measure emotional consciousness. But in order to do so fruitfully, we have to recognize that not all behaviors that co-occur with an experience are of equal value in measuring that experience (LeDoux and Daw, 2018). For example, in a dangerous situation a variety of responses can result:

- \*reflexive responses (startle).
- \*fixed action patterns (freezing or fleeing).
- \*instrumental habits (avoidance).
- \*goal-directed actions (behaviors based on mental model-based plans).
- \*conscious actions (behaviors, including speech, that are downstream of conscious states).

The most direct way to measure consciousness is by way of consciously controlled actions. Somewhat less directly, processes underlying non-conscious goal-directed actions can be used. These processes can be pre-conscious antecedents that contribute to the construction of the conscious states. The further down the hierarchy of control you go, the more automatic the responses become. As such, habits, fixed action patterns, and reflexes are the least valid measures of conscious emotional states. They can operate in parallel, and can be correlated with conscious states, but at best they only indirectly contribute to conscious experiences.

### 4. The four realms and behavior

In *The Four Realms of Existence* (LeDoux, 2023) I offer a synthesis of my empirical work in rats with my career-long interest in human consciousness. The four realms are biological, neurobiological, cognitive and conscious.

All biological beings, all organisms, possess basic life-sustaining processes such as metabolism, as well as the species-sustaining capacity for replication. Some biological beings, namely animals, possess a nervous system. Nervous systems make possible greater speed and more precise body control than exists in any other kind of organism. Some animals supplement mere neurobiological existence with the ability to create internal representations of the environment and use these to construct mental models that make predictions about the world—all of which endows those animals with greater flexibility in responding behaviorally to challenges and opportunities in life. And some, but not all, cognitive creatures also exist consciously. But my focus was not so much on which animals have which realms. It was instead on how the intricately entwined realms account for everything about human existence.

The conscious realm is enabled by the cognitive realm, which depends on the neurobiological realm, which relies on the biological realm. Each realm anatomically permeates and physiologically enables the level above it, and at the same time, the survival potential of the level below is enhanced by the one above.

The various behaviors in the taxonomy above map onto the three realms that are made possible by the human nervous system. Reflexes, fixed action patterns and habits belong to the neurobiological realm. Goal-directed actions depend on cognitive realm activities (internal representations, schema and mental models). And conscious goal-directed actions belong to the conscious realm. The further removed organisms are from humans the less likely it is that they will have conscious states that resemble ours (LeDoux, 2021; LeDoux and Birch, 2023).

This perspective seems that it could be incorporated into the Human Affectome Project and be useful to its efforts to understand interrelations between conscious and non-conscious processes.

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