

Afterword: *What is an emotion?*

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“... *bodily changes follow directly the perception of the exciting fact, and that our feeling of the same changes as they occur IS the emotion.*”

—William James (1890/1950)

Emotions vs. Feelings (and Other Responses)

For James, feelings were the defining feature of an emotion. While his writings remain influential, Damasio & Damasio join with a number of the other authors in arguing that James planted the seed for a long-lasting, troubling issue in affective sciences (for a detailed analysis, see LeDoux, 2015). For the Damasios, James’ failure to distinguish between emotions and feelings “... created a confusion of the two phenomena that has haunted the field to our day. Emotions and feelings were already muddled concepts but at the authoritative hand of James they became hopelessly so.” Likewise, Lang & Bradley consider feelings to be a folk psychological notion, and Adolphs argues that conflating “feelings” with “emotions” is “one of the most serious obstacles” to a science of emotion.

Lang and Bradley highlight the importance of going beyond feelings and measuring other responses, including systematic changes in peripheral physiology (e.g., cortisol, heart rate), action tendencies (e.g., freezing, facial expressions), and cognition (e.g., vigilance). But, just as feelings should not be conflated with emotions, Adolphs, Lang & Bradley warn us not to conflate emotions with these response channels. As Adolphs summarizes, “The evidence for the emotion is not the emotion itself” (see also Adolphs, *in press*; Quigley & Barrett, 2014).

Emotions vs. Cognition

Should emotions be distinguished from cognition (see Question 8)? That is a point of disagreement amongst the authors. As Damasio & Damasio note, James drew a crucial distinction between them; cognitive processes were

said to have a relative “purity” compared to emotional processes involving the body. Damasio & Damasio appear to agree with James’ argument, while acknowledging that feelings can also encompass thoughts and memories. Adolphs tells us that emotions interact with cognition, but are distinct from perception, attention, and memory. Berridge notes that defining emotion as “intrinsically affective” helps to distinguish it from processes, such as cognitive appraisals of value, that may relate to an emotion, but are distinct from the emotion itself. Rolls and Friston et al. emphasize the intimate connections linking the two phenomena, with Rolls suggesting that “cognitive processing (whether conscious or not) is important in many emotions... Indeed, emotions normally consist of cognitive processing that analyzes the stimulus, and then determines its reinforcing valence.” Barrett goes a step further: “Are emotions, cognitions and perceptions separate phenomena caused by separate processes? No. Instances of emotion are constructed by domain-general systems in the brain and body.” Clore adopts a similar position, noting that “the sharp distinction between cognition and emotion has probably outlived its usefulness.... Both arise from largely common processes, and imaging data indicate that they depend on overlapping neural systems.”

Emotions are Valenced and Vary in Intensity

All of the authors seem to embrace a dimensional account of emotions, with valence conceptualized as the core dimension. As Damasio & Damasio note, “Affective phenomena are...good, bad, or somewhere in between, but they are never indifferent.” In contrast with the first edition of this volume, none of the present contributors explicitly advocate a discrete or basic emotions approach (but see Panksepp’s response to Question 5 and Keltner and colleagues’ response to Question 10).

For many, this valence dimension is superimposed on an orthogonal intensity or arousal dimension. Adolphs reminds us that linear increases in intensity or arousal can lead to non-linear transitions in behavior (e.g., freezing in response to distal threat vs. fighting in response to imminent threat; see also Blanchard & Pearson's response to Question 7). Lang & Bradley conceptualize valence and arousal in terms of two dissociable systems: an appetitive motivation system that promotes approach and positive affect; and a defensive motivation system, that promotes behavioral inhibition, avoidance and negative affect. Rolls and Clore describe similar models, with Clore noting that, "Positive value is marked by pleasure and approach inclinations, negative value by displeasure and avoidance inclinations." Clore emphasizes that the pleasantness or unpleasantness of emotional states is at the core of their functional usefulness. Friston et al. stake out a different position, arguing that positive affect arises from decreases in free energy (or resolution of surprise), whereas negative affect arises from increases in free energy (or uncertainty). Berridge cautions us that valence is a "minimal necessary condition" for defining an emotional experience, but is not sufficient for capturing the complexity of emotions that emerge in particular situation (e.g., anger vs. fear). He also reminds us that the debate over the dimensional structure of affect has persisted for over a century without definitive resolution.

Emotions are Functional and Motivationally Potent

Most of the contributors advocate a functional account of emotions, which Adolphs articulates perhaps most clearly: Emotions are internal, functional states that provide causal explanations for behavior, feelings, and cognition—they should therefore be delineated by "*what they do*" rather than by how they are "*constituted or implemented*" (see also Adolphs, *in press*). Rolls offers another comprehensive description, highlighting the role of emotions in arousing autonomic responses, biasing cognition, and motivating action, as well as communication and social bonding (see Questions 8-10). Clore posits that emotional states should be distinguished by *what they are about*, emphasizing that "the function of emotional reactions is to inform the

organism of the value of events in the world, their urgency and their importance.” In doing so, emotions incentivize future action (preparation, planning, choice and coping) given the individual’s best prediction of costs and benefits.

Damasio & Damasio tell us that William James “was well aware of the...fact that...[feelings] were not happening under voluntary control” and go on to argue that “feelings compel their experiencers to take appropriate measures....[they] capture attention and seize the moment.” A number of the other contributors emphasize that emotions are motivationally urgent and non-deliberative. To Clore, Rolls, Lang & Bradley, and Adolphs, emotions have an essential evaluative component that informs future action based on prior experiences. According to Damasio & Damasio, events are classified as good or bad, harmful or helpful quickly, even automatically. In doing so, they often trigger action tendencies and activity in the autonomic nervous system that prepare the body for adaptive action. Damasio & Damasio consider action sequences to be “the essence of the emotions.” Along similar lines, Adolphs highlights the prepotency of emotions in their control of behavior, noting that they require “additional regulatory mechanisms to override their expression”.

Friston et al. and Barrett concur that a fundamental function of emotions is to enable the organism to optimally interact with the environment equipped with predictions from prior experience, but they embrace a constructivist approach (Barrett, 2017; *in press-a*; *in press-b*). Rather than considering emotions “reactions” to sensory inputs, emotions are regarded as events constructed by the brain to “make meaning of (incoming) sensations.” In Barrett’s “Conceptual Act Theory” (CAT), the brain’s primary job is to generate a model of the world given sensory input—anticipating it and adjusting to it accordingly. This model generation uses stored knowledge organized as concepts. An emotion is thus constructed when the conceptual representations employed by the predictive brain contain emotion knowledge; thus, there can be as many emotional states as an

individual has conceptual knowledge for it (reminiscent of James, 1894/1994). Similarly, Friston and colleagues argue that by utilizing stored conceptual knowledge, the brain generates top-down predictions of sensory inputs that contain expectations (i.e., beliefs), and an estimate of their precision. Emotional experiences are the precision of (or confidence in) the best hypothesis of how our bodies should respond given the current situation. In other words, emotions are second-order attributes—*the precision over a belief*—and “emotional processing” is the updating of the precision of the consequences of one’s actions. Those beliefs are updated based on *prediction errors (or surprise)*—which our (motoric and autonomic) actions in the world should minimize. A key difference between the Friston et al. and the Barrett proposals is that when an incoming sensory input does not match the prediction, the result in CAT is arousal (which can take the form of surprise, fear, curiosity, etc.—depending on the individual’s conceptualization of it); rather than surprise, as would be postulated by Friston et al. and other predictive coding theories.

Emotions are Behaviorally Flexible

Emotions may be prepotent, but Adolphs and several other contributors highlight two ways in which emotions differ from reflexes: their behavioral flexibility and their temporal persistence. With regard to the flexibility, Adolphs describes emotions as intermediate between reflexes—rigid, inflexible, and stereotyped—and reasoned, intentional states and behavior (e.g., purchasing a new home, writing a novel or dissertation). Specifically, emotional responses are relatively decoupled from the emotion-evoking stimulus, because they incorporate contextual information. Relatedly, Clore argues that “specific emotions do not dictate specific behaviors. Indeed, a great advantage of emotions is that they provide mental way stations between stimuli and responses that allow for flexibility in response.” Friston et al. and Clore emphasize that emotions are exquisitely sensitive to context. As Clore notes, “emotions are most readily categorized in terms of the situations they concern, rather than in terms of responses, which depend on the context in which they occur” (see Question 7).

Along these lines, Rolls suggests that emotions, unlike reflexes or habits, “include representations of goals...and are independent of the actions made to obtain the goals.” Damasio & Damasio and Lang & Bradley seem to hold similar views. Adolphs makes the point that this intermediate level of behavioral flexibility—between that of reflexes and intentional states—is a central feature of emotion and provides important clues about the *content* of emotions. For instance, they may be pertinent to challenges too complex for reflexes to solve or they may be especially relevant in motivationally or behaviorally ambiguous situations.

Several contributors highlight the persistence of emotional states, which outlast the emotion-evoking stimulus. Adolphs argues that “unlike reflexes, they [emotions] are relatively decoupled from stimuli...they persist.” Clore reminds us that emotion is a dynamic process that unfolds over time. Barrett suggests that feelings, or what she terms “core affect”, are “slower to change than actual sensations in the body.” Rolls emphasizes a functional explanation for the persistence of emotions, arguing that “by enduring for minutes or longer after a reinforcing stimulus has occurred, [emotions]...help to produce persistent and continuing motivation and direction of behaviour, to help achieve a goal.”

Emotions and Consciousness

Finally, do emotions require consciousness (see Question 12)? The authors who explicitly addressed this issue stated that it does not. Adolphs proposes that, like vision or memory scientists, affective scientists should not require conscious experience to be a prerequisite for their phenomenon of interest. Likewise, Clore and Rolls postulate that consciousness of an emotional state is not obligatory and will only occur only if consciousness is advantageous for the organism, in terms of predicting upcoming changes in the world (Clore) or correcting errors of reasoning (Rolls). Adolphs tells us that, while emotions are not isomorphic with feelings and, in fact, can be studied without reference to conscious experience, the conscious experience of emotion is real and

important. As such, understanding how emotional states emerge into consciousness to give rise to feelings will be a critical direction for future work, and a prerequisite for fully understanding the nature of emotion.

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