consciousness research has also long moved beyond the notion that "unconscious equals weak." Instead, the current research sees the emotional brain as having multiple processing pathways which, while generally integrated, can occasionally dissociate and produce interesting phenomena where even strong and differentiated emotion states remain unconscious (see Winkielman, Berridge, & Wilbarger, 2005).

In summary and conclusion, the authors' cognitive framework beautifully captures many inferential complexities of emotion processing. It highlights the flexibility that people have as perceivers, experiencers, and users of emotion. It also helps appreciate what many complex human emotions are about. All this shall help guard us, emotion researchers, from the simplistic assumptions plaguing contemporary research. But it may be time to take challenges to symbolic views of the mind more seriously and build new modality-based emotional processing frameworks. It may also be time to incorporate into our emotion frameworks the multi-level processing perspective that emerges from contemporary psychology and neuroscience. This way, our theories and our research can become as sophisticated as the emotions themselves.

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Comment

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Varieties of Emotional Experience: Differences in Object or Computation?

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Abstract

Discovering the taxonomies that best describe emotional experience has been surprisingly challenging. Clore and Huntsinger propose that by exploring the objects of emotion, such as standards or actions, we may better understand differences in emotion that emerge for similarly valenced reactions. We are sympathetic to this idea, although we suggest here that greater attention should be given to the computations that accompany affective processing, such as the discrepancy between different hedonic states, rather than the object per se.

Keywords
social psychology

Understanding subtle differences among emotional states is thought to be necessary for survival because emotions reflect critical changes in the self or the environment that guide goal directed behavior. Although many of these emotions appear to require quite complex appraisals, people can quickly differentiate not only happiness from sadness, but also anger from other negative emotions such as fear and disgust (Ekman, 1999). People rarely seem to have difficulty describing and understanding their own or others' emotional experiences. Yet, despite the relative ease with which people generate and understand emotions, there is little scientific consensus about the appropriate taxonomy for describing emotional categories. Indeed, the very question of whether "basic emotions" such as anger, fear, and disgust are evolutionarily-derived biological primitives or constructions that follow cultural learning and cognitive appraisals of simple hedonic tone (e.g., pleasant/unpleasant and arousal) have plagued scientific models of emotion for some time (Barrett, 2006).

Clore and Huntsinger (this issue) propose a model of emotion categories where the *object* of affect determines the emotional state. Specifically, people are pleased-displeased about outcomes (goals), approve-disapprove of actions (standards), and like-dislike objects (tastes). Because the objects and processes underlying these types of evaluations differ, the resulting emotional state

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should differ as well. For example, fear is the result of "displeasure about the prospect of an undesirable outcome of events," whereas sadness is the result of "displeasure over an undesirable outcome of events relevant to one's goals." We are sympathetic to the authors' attempt to better understand the processes that may give rise to discrete emotions, although we suggest a slightly different focus. Our lab has recently proposed the Iterative Reprocessing Model of evaluation (IR: Cunningham & Zelazo, 2007), and we have begun to expand this model into a more general model of affect. The IR model provides a framework for understanding how basic emotion categories can be emergent properties of more simple computations of valence in a hierarchical cognitive system. This framework is consistent with Clore and Huntsinger's (this issue, see also Barrett, 2006) argument that basic emotions stem not from modular systems, but rather the interaction of cognitive pro-cesses (which may operate automatically and unconsciously) with more basic affective cues and allows for the generation of discrete emotional states while conforming to current beliefs about the cognitive and neural architecture of the human mind. Rather than using the *type of object* as the means of deriving the taxonomies of emotional experience, we consider the *types of computations* as the key elements that give rise to differentiated emotional experience. Obviously, the type of object and type of computation are largely correlated, but we believe that this change in focus offers a fruitful approach for considering emotional experience.

We propose that three hedonic representations and comparator processes that compute the differences among representations can account for a host of "basic" emotion findings. *Previous hedonic state* represents how the organism was doing in the distant or immediate past. *Current hedonic state* represents an appraisal of how the organism is doing right now in the current situation. *Predicted hedonic state* represents how the organism is likely to do in the future, including how perceived changes in the environment are likely to change one's hedonic state. *The delta function (*Δ*,* the result of a comparator process) computes and represents whether things are getting (or have gotten) better or worse by comparing the *current* with *previous* or *predicted* hedonic states (e.g., Frank & Claus, 2006). Current hedonic state is conceptually similar to the idea of Core Affect, and the predicted hedonic state is similar to Anticipated Affect (Russell, 2003). These three hedonics and delta functions can represent many of the basic emotions through main effects and interactions. For example, to reinterpret the examples provided by Clore and Huntsinger (this issue), fear is simply processed as a predicted negative future state, whereas sadness would follow from a negative comparison (Δ) between the current hedonic state and a previous hedonic state (with joy simply being the opposite Δ). Other emotions may require multiple processes; the moral outrage or anger/frustration that follows from an actual hedonic state being less than predicted. These processes can also be focused outward, and by representing the three hedonics and delta in others, we can infer and share their emotions (from sadness to joy) or feel social emotions, such as moral outrage, when their hedonic state changes. This framework follows from current circumplex models in that hedonic states can be described along two dimensions. Unlike many current circumplex models, however, we propose that the three hedonic states are represented independently and that many basic emotions cannot be represented within a single two dimensional representation, but are rather represented as interactions among representations.

One potential difficulty in emotion research is distinguishing between the semantic labels used to describe emotions and "actual" emotions, such as disgust (Nabi, 2002). In Clore and Huntsinger's framework, disgust is experienced as providing information about objects. However, current theory makes a distinction between core and symbolic disgust (Rozin, Haidt, & McCauley, 1993). Although both are coined *disgust*, core disgust is triggered by specific *objects* (e.g., rotting meat) whereas symbolic disgust is triggered by the transgression of moral *standards* (e.g., incest). Recent neuroimaging research has shown that core and symbolic forms of disgust share many common neural substrates although symbolic forms recruit additional anterior prefrontal processes (Borg, Lieberman, & Kiehl, 2008). These data are consistent with the idea that core and moral disgust are differentiated by processes that extend beyond objects and mere linguistic confusion. We acknowledge that these linguistic issues can also be problematic for our conceptualization; one can generate examples of anger that do not necessarily follow from the same comparator process we propose between prediction and outcome (e.g., sham rage; Bard, 1928). It is for these reasons that we believe that specifying the computations underlying different emotional responses can help identify actual distinctions between emotions. With a greater specificity of the cognitive representations and neural computations underlying distinct hedonic states, we are optimistic that we can not only generate more appropriate taxonomies of emotion but also generate better linguistic descriptions of emergent emotional states.

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