

Clore, G. L. & Ortony, A. (2008). Appraisal theories: How cognition shapes affect into emotion. In M. Lewis, J.M. Haviland-Jones, & L.F. Barrett (Eds.) *Handbook of Emotions*, 3rd Ed. (pp. 628-642). New York: Guilford Press.

Chapter 39

Appraisal Theories:¹

How Cognition Shapes Affect into Emotion

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Handbook of Emotions 3rd Edition

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Editors

Guilford Press, New York

Although humans are comparatively hairless as mammals go, fear can still cause the hair on the back of your neck to stand on end (Huron, 2006, p. 33)

At dusk recently, while walking in the woods, one of us was startled by an arresting sound. It turned out to be a male deer announcing his presence with a loud snort. The realization that it was only a

deer came quickly, and the whole sequence from startle to categorization took only an instant. But then he experienced a novel, surprising sensation as the hair on the back of his neck stood up. Despite the cognitive reassurance that it was only a deer, the body was apparently still preparing for a nameless threat.

So, what happened in this episode in the woods? Were appraisals involved? Was fear elicited? If so, did fear cause the piloerection? With respect to the latter question, William James would certainly have said, "No." He famously claimed that we are "afraid because we tremble," rather than the other way around (James, 1890, p. 450). In this chapter, we explore such questions, and end up agreeing both with James and with appraisal theorists.

Appraisal Theory and Its Critics

Appraisal theory, as we know it today, is usually attributed to Magda Arnold (1960), who made an early and influential statement of the cognitive approach to emotion. She proposed that people implicitly appraise or evaluate everything they encounter, and that such evaluations occur immediately and automatically. Among others who were important in defining cognitive approaches to emotion were Schachter and Singer (1962), Lazarus (1966), and Mandler (1975). But it was not until the 1980's that the seed planted by Arnold began to take root. Following pioneering work by Roseman (1979; 1984), a number of appraisal theories appeared. These included, in addition to Roseman's own theory (1984), an often cited account by Smith and Ellsworth (1985), an influential theory by Frijda (1986), and accounts by Oatley and Johnson-Laird (1987) and by Ortony, Clore, and Collins (1988). In addition, Scherer (1984) generated a

¹ Support is acknowledged from National Institute of Mental Health grant MH 50074 and National Science Foundation grant BCS 0518835. Correspondence can be directed to Gerald Clore, 102 Gilmer Hall, P.O. Box 400400, Charlottesville, VA 22904-4400. gclore@virginia.edu.

treatment of emotion that emphasized the temporal sequence of the appraisals. Other more limited approaches included Weiner's (1985) attribution theory, Higgins' (1987) self-discrepancy theory, and Shaver et al.'s (1987) prototype account. The details of many of these theories can be found elsewhere (e.g., Clore, Schwarz, & Conway; 1994), and some are presented by their authors in an edited volume on appraisal theory (Scherer, Schorr, & Johnstone, 2001).

Despite this flowering of interest, appraisal theory turned out to be controversial. Some investigators found appraisal theories implausible, because they read accounts of *appraisal structure* as though they were assertions about *appraisal process* (e.g., Prinz, 2005). Although appraisal theorists themselves often helped blur the distinction, it is an important one. The difference can perhaps be appreciated from an analogous difference between the formal rules of syntax and the processes involved in speaking. Linguists might all agree that observing the rules of syntax is important for communication, but none assume that speakers consult such rules before opening their mouths to speak. Similarly, theories of the structure of emotional appraisals do not claim that people consult such rules before feeling anything. In addition, some critics argue that emotions are too fast for cognitive appraisals. However, the validity of structural accounts of emotion is no more contingent on the speed of emotion, than is the validity of structural accounts of language dependent on how fast people talk.

In this chapter, we focus on issues relevant to theories of appraisal process, rather than theories of appraisal structure. Also, rather than focusing on what has been said in the past, we emphasize ideas that have appeared recently. We ask

questions about emotion and appraisal, including what emotions are and in what sense they exist. One answer to that question is that emotions exist only in the sense that the big dipper exists; namely, in our perception (Russell, 2003). We also ask whether emotions cause behavior. Some investigators argue that unconscious affect causes behavior, but that full blown emotions do not (Baumeister, Vohs, DeWall, & Zhang, in press). We ask whether appraisals are really necessary in the emotion process. The philosopher, Prinz (2005), argues that appraisals are no more necessary for emotion than for pain. Finally, we ask what it is that process theorists have in mind when they refer to appraisals. We review both dual process models (Clore & Ortony, 2000; C. Smith, et al, 1996; E. Smith & Neumann, 2005) and alternatives to dual process models (e.g., Barrett, 2006; Huron, 2002; Cunningham & Zelazo, 2007).

In our own view, emotions are cognitively elaborated affective states (e.g., Clore & Ortony, 1988; Ortony et al, 1988; Ortony, Norman & Revelle, 2005). In this characterization, we take "affective" to mean anything evaluative, and we propose that "states" exist when multiple components represent or register the same internal or external situation in the same time frame. Thus, one can think of emotions as involving multiple representations of something as good or bad in some way. Appraisal theories address the nature of such evaluations. The general view we take in this chapter is that, like the piloerection example with which we started, low level bodily, hormonal, and affective reactions often get the emotional process started, and that cognitive appraisal processes act like a sculptor, shaping general affective reactions into specific emotions. Before we address the process, however, we ask

about the nature of the emotions that involve such appraisals.

1. Are Emotions Situated Constructions?

Theorists increasingly view psychological processes as distributed across multiple sources (e.g., Clark, 1997), and behavioral and affective responses as situated or context specific (e.g., Brown, Collins, & Duguid, 1989). Consistent with such approaches, Barrett (e.g., 2006) has proposed that emotions are not distinct states with clear boundaries; they are not hard-wired in the brain, and they don't have distinctive psychophysiological signatures and facial expressions. Emotions do, of course, involve facial expressions, psychophysiology, and specialized brain areas, but the boundaries of these events are not those of specific emotions such as anger, fear, and shame. Rather than reflecting similar entities in the brain, Barrett suggests that emotions involve combinations of processes with much more variability than is implied by the discrete or basic emotions view.

The prevailing psychological picture has been that emotions are distinct entities in the body or evolved modules (e.g., Ekman, 1984). Once activated by emotional stimuli (e.g., snakes for primates), these emotions are evident in distinctive expressions, thoughts, feelings, neuro-chemistry, and behavior. But Barrett suggests that positive and negative affective reactions and arousal, the dimensions of "core affect" (Russell & Barrett, 1999), may be the only necessary givens in the body. The specific emotions of fear, anger, shame, and so on are situated instances of such affect. For example, "fear" is a label for negative affect in situations involving threat, whereas the same negative affect in

situations of loss might be called "sadness," and a reaction to blameworthy behavior might be called "anger" (for a related view, see Sabini & Silver, 2005).

Barrett's (2006) review of relevant research shows that the boundaries between similarly-valenced emotions are not as distinct as is usually assumed. If confirmed, such observations would not necessarily make specific emotions any less important, powerful, or universal. They would simply change the locus and nature of their distinctiveness. In such a view, what makes emotions universal is not their biological status, but the situations to which they are responses. If there is anything basic about fear, anger, joy, and disgust, it lies in the ubiquity of the life situations to which these emotions are responses, rather than in distinctive biological signatures, which she says research does not find.

In this alternative view, the experience of specific, distinct emotions arises partly from cultural knowledge about emotions. In a similar manner, experiencing colors of similar wavelengths as the same or as different depends partly on the boundaries provided by one's language. For example, cultures with separate concepts for blue and green see two different colors where those without a separate category for green might see only variants of blue. Barrett suggests that distinguishing two points along the affect dimension as two emotions rather than experiencing them as variants of one emotion may be similarly influenced. In other words, concepts may augment sensations to create experiences both of distinct colors and of distinct emotions.

Evidence that concepts do help create the boundaries of emotions comes from experiments inducing semantic satiation

of an emotion word (by multiple repetitions), which makes the word temporarily lose meaning (Lindquist, et al, 2006). After semantic satiation of the word “anger,” for example, people were no longer able to swiftly recognize that two patently angry faces were expressing the same emotion presumably because the temporary breakdown of access to the anger concept caused by the satiation manipulation made it difficult to “see” the emotion in the faces.

Barrett’s work appears likely to spark debate in much the same way as Mischel’s (1968) book with a similar message about personality. Mischel argued that the available evidence failed to show the high degree of cross-situational consistency in behavior that he said was demanded by traditional ideas about personality. He called for a view of personality that would reflect the contingent and situated nature of individual differences in behavior potential. After 40 years of debate and revision, the field of personality study is arguably healthier, even though many personality theorists still strongly disagree with Mischel’s position. Similarly, Barrett is saying that the evidence does not support the idea that emotions are tightly organized, evolved modules with distinctive expressive, experiential, and neural signatures. It remains to be seen whether her claims will have a similar effect on the study of emotion.

2. Are Emotions Latent Entities or Emergent Phenomena?²

Theorists have traditionally thought about emotion in terms of a latent trait model. Research from that perspective generally involves searching for evidence

² The idea that this distinction is of central relevance to the study of emotion comes from the affective neuroscientist, James Coan (personal communication, December 2006).

of an unseen entity by measuring its indicators – expressions, physiology, behavior, experience, and so on. An alternative to that model would be to treat emotion, not as a latent entity, but as an emergent phenomenon. In such a model, rather than depicting the arrows going outward from emotion to its several indicators, the arrows would go the other way, pointing inward. The factors considered as indicators of emotion in a latent trait model would be treated as constituents of emotion in an emergent model.

In this view, emotions are merely the conjunction of expressions, physiology, behavior inclination, experience, and so on (Clore & Centerbar, 2004; Clore & Ortony, 2000). It sees emotions as affective states, in which multiple systems register the same emotional significance at the same time. For example, if threat were registered simultaneously in facial expression, posture, tone of voice, thought, motivation, neurochemistry, autonomic activity, brain activation, and so on, the person would clearly be in a state of fear. Indeed, that is what we mean by “fear”—being in a state dedicated to threat. And this is what we meant when earlier we characterized a state as the co-occurrence of multiple components representing or registering the same internal or external situation. When the thing registered is evaluative, the organism is in an affective state. Emotions and moods are examples of such affective states.

In a latent trait model, an emotion can exist whether or not it is expressed in the face, in the voice, in postures, actions, thoughts, desires, neurophysiology, or brain states. In the emergence model, these things are constituents of emotions, so that an emotion exists by virtue of their co-occurrence. If one’s thoughts turn

elsewhere, one's physiology reverts to baseline, one's voice, face, posture, and behavior inclinations no longer represent threat, and so on, one is no longer afraid. Of course, in neither model is it necessary for each and every aspect to be evident. One can surely be afraid without gaping, opening one's eyes widely, and developing a squeaky voice. But to be in a genuine state of fear, threat must be multiply represented. In summary, in this section, we asked four questions. First, we compared classical views that emotions are evolved, tightly organized modules with an alternative view of emotions as loosely organized, psychologically constructed states, consisting of situated elicitations of core affect (Barrett, 2006). We have considerable sympathy for the latter view (e.g., Ortony et al, 2005). Next, we contrasted the usual latent variable model of emotion, in which experience, expression, action, physiology, and so on are indicators of emotion with an emergent variable model, in which these facets of emotion are seen as constituents rather than consequences of emotion. Our own view is compatible with an emergent variable model (e.g., Clore & Centerbar, 2004). We turn next to an examination of the process of appraisal.

The Nature of Appraisals

3. Are Appraisals Cognitive or Perceptual?

Critics of appraisal theory often object not to appraisals per se, but to the idea that they are cognitive in nature. Some consider themselves appraisal theorists, but not *cognitive* appraisal theorists (LeDoux, March 2006). In contrast to cognitive accounts of emotion elicitation, Parkinson (2007, p. 22) suggests that emotions emerge, "as direct adjustments to relational dynamics, not articulated responses to propositional

representations of appraisal information." He argues that if one steps onto a bus and one's carrier bag splits apart, scattering groceries across the pavement, one feels frustrated directly in a way that does not require verification of appraisal-relevant propositions. Similarly, Parkinson (2007, p. 21) says that, "The minimal precondition for anger is simply resistance stopping us from getting through," and that a stimulus, such as a gunman, can be directly perceived as scary without requiring (cognitive) appraisals (for a similar view, see Berkowitz, 1990).

Parkinson seems to be interpreting propositional accounts (e.g., Siemer & Reisenzein, 2007) of goals and goal blockage as requiring an explicit analysis of one's situation before emotion can arise. But it is not clear that anyone holds such a position. A propositional analysis of the distress at seeing one's groceries scattered across the pavement does not imply that people explicitly entertain various propositions in order to feel frustrated. Rather it is a formal *description* of the implicit meaning of that perception just as a parabolic equation might be a formal description of the trajectory of a ball thrown through the air. Such a description does not imply that the ball computes a mathematical function. Seeing one's groceries spill out surely would produce distress directly and without thought, but a propositional analysis does not suggest otherwise. Whatever cognitive activity is involved is implicit. A number of models (described below) have addressed such issues, arguing that any requisite cognitive activity can be exceedingly rapid and without conscious thought.

Nevertheless, one can argue that many of the criteria for emotion elicitation are as much perceptual as cognitive, including whether an emotionally relevant

outcome is one's own or another's, whether it has already occurred or is yet to occur, and whether it follows from one's own action or that of another. Of course, each of these is sometimes ambiguous, but in many instances such considerations are perceptually given. Thus, some of the rules of emotion elicitation may lie simply in the topography of psychological situations.

A defense of a perceptual as opposed to a cognitive view of appraisal was made by Buck (March 4, 2007), who proposed an ecological view in which he suggested that explanations for emotion lie not in the mind, but in what the mind is in (Gibson, 1969). With this allusion, Buck intended to invoke Gibsonian perceptual theory against appraisal theory. The Gibsons offered a strong alternative to cognitive theories of perception. Thus, he prefers seeing emotions as perceptual rather than cognitive and as reflecting the ecology of the perceiver rather than his inferences.

4. Are Appraisals Cognitive or Situational? On being emotional chameleons.

Thus far, we have treated emotions as emergent, situated, and constructed from underlying affective dimensions. In this view, when a situation and the appraisal or pattern of the kind specified in appraisal theories match, then the corresponding emotion can result. If so, then emotional differentiation may simply reflect situational variation.

If we think of emotions as reactions to different situational structures, then the only essence that instances of emotion share is in the situation they represent. Emotions may thus be radically situated. If so, the fact that one instance of anger or fear or joy looks a lot like another is not so much evidence that a discrete emotion has been evoked as that aspects of

whatever situations elicit fear, anger, or joy have constrained affective reactions in distinctive ways. Thus, the source of the distinctiveness of an emotion may lie in the nature of the situation it represents, not in a stored pattern of latent, emotional potential. In this view, emotions are not entities, any more than cognitions exist as entities. Just as chameleon's cope with variations in their environment by changing color, so we cope by transforming ourselves emotionally into a reflection of our environment.

A variety of writers have tried to equate emotions and situations. For example, Polt (1921) proposed that there are 36 basic plots in the history of drama corresponding to 36 emotions. They concern love, tragedy, hope, fear, betrayal, honor, sacrifice, passion, lust, sympathy, ambition, jealousy, short-sightedness, courage, revelation, forgiveness, deliverance, rivalry, jealousy, and more. There is probably no good reason to assume that there is anything truly basic about these categories or that another investigator might not find more or fewer. Moreover, each narrative situation would surely involve many emotions. But the larger point is that there are recurrent patterns of situations in human affairs, which have been the stuff of drama from the Greeks to the present. The actions depicted are energized and directed by universal human motivations, and the dramatic turning points are marked by the emotions of characters and audiences.

The Process of Appraisal

5. Are Emotions Too Fast or Too Mindless For Appraisals?

Automaticity. Reservations about cognitive appraisal theory often rest on the observation that emotions are too fast and too mindless to be based on extensive

cognitive processing. Of course, mindlessness is a feature of most cognitive reactions as well. For example, people are good at determining whether the footsteps they hear belong to a man or a woman (Huron, 2002). It turns out that the sound is different because the timing of heel then toe hitting the ground is shorter for small than for large shoes. We are good at making this discrimination, but we do it mindlessly. We are unaware of what cues we use, and certainly never think of foot size or of shoe movements in order to decide on the sex of the person. Instead, we directly hear a man or a woman. It is a learned association, but we remain ignorant of any explicit knowledge of what we have learned.

In addition to being mindless, emotional reactions are often assumed to be too fast for cognitive appraisals. However, Moors (2006) has recently reported research explicitly examining appraisal time, and she concludes that there is no reason to assume that cognitive processes are too slow to produce emotion. Through clever experiments that build on prior research on automaticity and affective priming, she has shown that appraisal judgments can be rapid and automatic. Also, Moors and DeHouwer (2001) demonstrated that stimulus valence and motivational relevance can be determined rapidly and automatically, as assumed in many appraisal theories.

Other research has shown that people may be faster to infer emotion (on the basis of brief vignettes) than to infer the appraisals on which emotions are believed to depend (Siemer & Reisenzein, 2007). But, of course, this finding does not mean that emotions cannot be based on cognitive appraisals. Nor do these authors suggest otherwise. Categorizing a figure as a bird might also be faster than judging whether the figure has wings, even though

having wings might be one of the criteria for making that categorization in the first place. Since there are multiple attributes that contribute to birdness (or to emotion), a categorization might be made as soon as the collective activation of some of them is adequate. That might occur before any single attribute is sufficiently activated to serve as a basis by itself, and long before respondents could affirm the presence of that attribute in self-reports.

Siemer and Reisenzein (2007) adapt an existing cognitive model (Anderson, 1983) to explain why their finding does not mean that emotions precede appraisal. They argue that, with experience, appraisals become automated and appraisal programs get compiled so that they not only become rapid, but the intervening steps become inaccessible (Wegner & Vallacher, 1986). This dual process approach assumes that with practice emotion inferences can become faster than appraisal inferences. As in playing the piano, routines become automated as they are repeated over and over. One implication of this view is that whereas emotions might be quick to arise in adults, children might have to think before they feel. But this particular implication seems unlikely, so that dual processes reflecting the automatic-controlled distinction, in which automaticity is achieved through practice, may be less relevant than models in which one of the processes is, for example, heuristic or associative rather than simply well practiced.

Dual Process Theories. Dual process theories have become common in social psychology as a way of handling conflicting results. Rather than having to choose whether thinking is propositional or heuristic, dual process theories say that both are at work. The claim is that people engage in both heuristic and systematic

(Chaiken, Liberman, & Eagly, 1989) or central and peripheral (Petty & Cacioppo, 1986) processing.

Dual process models have similar power for handling data about emotion. A useful dual process model of appraisal has been based on a distinction between “associative processing” and “rule-based processing” (Sloman, 1996). This approach has been developed by Craig Smith and colleagues (e.g., Smith et al, 1996; Smith & Kirby, 2001), but others have also found the idea useful (Clore & Ortony, 2000; E. Smith & Neumann, 2005). Associative processing is guided by subjective similarity and temporal contiguity, whereas rule-based processing involves symbolic reasoning. In everyday categorization, we appear to use both subjective similarity and rule-based reasoning.

Both kinds of reasoning have also been proposed as playing a role in emotion elicitation. In new situations, emotions may involve considerable bottom up processing. As perceptions of a situation unfold and requirements for specific emotions are satisfied, reactions may become correspondingly differentiated. Similarly, as children develop and become capable of making relevant distinctions, their emotions too may become more differentiated. Such rule-based reasoning is probably only rarely conscious, explicit, or deliberative. Indeed, pre-verbal infants are already surprisingly adept at such implicit, rule-based processing (e.g., Kotovsky & Baillargeon, 1994; Needham & Baillargeon, 1993).

But emotions are presumably also elicited by associative processes. One may become happy, angry, or anxious simply by being in situations similar to those in which one was previously happy, angry,

or anxious. And since cognitive systems capitalize on prior experience rather indiscriminately, such associative processing may be the rule rather than the exception. The meaning and significance of an event is perhaps always partly contingent on its resemblance to other situations in one’s experience. LeDoux (1996) captured this idea by saying, “Emotion is memory.” In that regard, the emotionally relevant aspects of situations would seem to be recurrent rather than unique, so that prior appraisals are often reinstated, rather than our approaching each situation as a blank slate.

The kind of reinstatement mechanism we have in mind was actually proposed by Freud. For example, he proposed that “the act of birth is the first experience of anxiety, and thus the source and prototype of the affect of anxiety” (Freud, 1900/1955). He also believed that reactions to one’s father served as a prototype for one’s later emotional orientation to authority figures, and that falling in love was a reinstatement of the love of a child for its parent. To be sure, some of Freud’s examples seem to many of us bizarre and implausible, but the general mechanism of reinstatement has considerable explanatory power.

Bowlby’s (1969) infant attachment theory also assumes that early emotional reactions of love and attachment are the basis of later emotions. He saw the emotional protests of infants separated from their caregiver as evidence of an evolved tendency for them to bond or attach themselves emotionally to their caregiver. Later Ainsworth and colleagues (Ainsworth, Blehar, Waters, & Wall, 1978) identified specific patterns of infantile attachment believed to be reinstated in later romantic attachments. The idea that early emotional patterns reappear when people fall in love and

select their mates continues to be fruitful in contemporary attachment work (e.g., Morgan & Shaver, 1999; Shaver & Clark, 1994).

Although there may be more than one route to emotion elicitation, we would argue that the appraisal for a given emotion remains the same. Regardless of whether fear or anger arises from computation, conditioning, imitation, or predisposition, fear is always a response to apparent threat, and anger to apparent infringement. Whereas the constituent thoughts, feelings, and physiology may differ, each instance of anger or fear involves similar perceptions. Lazarus (1994) referred to these as “co-relational themes.” The idea, common to all appraisal approaches, is that there is a deep structure or underlying constancy in situations that makes them sources of anger, fear, or joy.

In summary, in this section, we examined an example of a dual process model (Clore & Ortony, 2000; see also Sloman, 1996; Smith, et al, 1996). We assume that different routes to emotional appraisal serve different functions. The typically faster, associative process of emotion reinstatement is useful for preparedness, whereas, the typically slower, rule-based, computation affords flexibility. On a continuum from rigidity to flexibility, creatures with more restricted emotional repertoires are less capable of flexible responding than creatures with more complex emotional repertoires. At the same time, presumably there is advantage both to flexibility of response and to automatic preparation for responding. As Scherer (1984) pointed out, the evolutionary advantage of emotion was that a stimulus could be registered and reacted to without the organism being committed to behavior.

These considerations suggest that emotion allows behavior to be contingent on a stimulus without being dictated by it. There are, therefore, two fingers on the emotional trigger—one from early perceptual processes that identify the emotional value of a stimulus to prepare for action, and one from cognitive processes that verify the nature of the stimulus, situate it, and appraise it (Clore & Ortony, 2000). This idea suggests that in addition to the kinds of dual processes discussed above, affective reactions may be initiated by low level processes that occur before cognitive involvement (see also Ortony et al., 2005).

6. Is there a Low Route to Emotion?

In the past decade, investigators of emotion have become increasingly interested in the role of subcortical processes in emotion. The work of LeDoux (e.g., LeDoux, Romanski, & Xagoraris, 1989) in finding a subcortical, “low route” to the elicitation of fear-relevant responses is the most well known. In studying fear conditioning in rats, LeDoux and his colleagues found a pathway from the sensory thalamus direct to the amygdala without first going to relevant areas of the cortex to be interpreted. To the extent that the amygdala is involved in fear and other emotions, this low route appeared capable of generating emotional responses before the organism could know what it was responding to or have any experience of fear. This finding was taken to imply that no cognitive appraisal was required for emotion after all. It would be difficult to overstate the impact of this discovery on thinking about emotion in the last decade. The idea captured the imagination, not only of other neuroscientists, but also of psychologists (Zajonc, 2000), political scientists (Lodge & Taber, 2002), and

economists (Camerer, Loewenstein, & Prelec, 2005).

The popularization of this work has helped generate interest in affective neuroscience. It was excellent science and has been important in stimulating further research on subcortical processes in emotion. However, many criticisms of the accepted interpretation have appeared (for an accessible review, see Storbeck, Robinson, & McCourt, 2006). The work was done on rats, and it now appears that the particular pathway examined may not exist or be active in primates and humans (Kudo, Glendenning, Frost, and Masterton, 1986), that it may not play the roles that have been ascribed to it even in intact rats (Shi and Davis (2001), and that by itself, this pathway would not be able to discriminate stimuli that had acquired emotional significance from those that had none, unless reduced to light vs. dark or similarly gross kinds of stimulation. Thus the popular narrative that this pathway alone, that is, without cognitive involvement, could generate a genuine emotion of fear of a snake might be untenable. Similarly untenable is the idea that human emotions, economic decisions, and political preferences take place without cortical involvement (see Clore, et al, 2006; Davidson, 2003). However, even if this particular pathway did turn out not to be as important as initially believed, and despite the fact that any subcortical process is insufficient to account for emotion, this work has stimulated important additional research and thinking about the critical role of subcortical processes in emotion.

Increasingly, it is apparent that behavior-relevant processing in the brain is highly recursive (Storbeck & Clore, in press). Sensory information from low level processes is progressively refined in an iterative process (Cunningham &

Zelazo, 2007). The kind of early, subcortical processes that LeDoux's work has highlighted surely do serve as an early warning signal that can bias the system to respond quickly to possible danger. Moreover, our collective realization of the pervasiveness and importance of these processes means that many existing appraisal theories are incomplete. We discuss in the next section two accounts that do include low level, reflex-like processes at the beginning of the emotion sequence.

7. Is Appraisal Sequential?

Charles Osgood (e.g., Osgood, Suci, & Tannebaum, 1957) proposed a theory of connotative meaning which was in many ways an affective appraisal theory. He proposed (and produced relevant evidence) that all words in all languages convey connotative meaning along three dimensions – evaluation, potency, and activity (the dimensions of E, P, and A from what he called the “semantic differential”). Osgood (1969) was interested in the development of language and communication, and he speculated about what kinds of information pre-linguistic humans would have needed most to communicate. He reasoned that the most important information for survival was whether something was good or bad, whether it was strong or weak, and whether its approach was fast or slow. Once one could locate something within this Evaluation, Potency, and Activity (EPA) space, coping behavior would be appropriately constrained. His idea was that triangulations from these connotative dimensions would allow people to make and to communicate the behavior relevant differences between, say, saber-toothed tigers and mosquitoes.

Scherer (1984; 2001) echoes the importance of E, P, and A, and also treats

them as dimensions of emotional meaning. He suggests that E is linked to the appraisals of stimuli with regard to goal/need conduciveness), P to coping potential, and A to appraisals of urgency. He proposed a series of stimulus evaluation checks (SEC's) believed to underlie stimulus appraisal. The type and intensity of any resulting emotion is then a reflection of the profile of results of the appraisal process based on these stimulus evaluation checks.

The stimulus evaluation checks proposed by Scherer (2001) begin with a (1) *Novelty check*, followed by (2) an *Intrinsic pleasantness check*, based on innate feature detectors and learned associations, (3) a *Goal/need significance check*, evaluating whether an event is relevant to goals, whether it is conducive to goals, expected and urgent. (4) A *Coping potential check* then follows, evaluating causation and the coping potential, control over consequences, relative power, and options for internal adjustment. (5) Finally a *Norm/self compatibility check* evaluates the compatibility of actions or events with social norms, conventions, or expectations of others as well as with internalized norms or standards of self. Scherer assumes that the outcomes of these checks change various subsystems that serve emotion – physiology, expression, motivation, feelings – creating a tell-tale trace that *is* the emotion. In addition, he emphasizes that emotions are fluid, reflecting constant evaluative activity.

In a somewhat related way, the music cognition theorist, David Huron (2002) has analyzed the emotion process suggesting six stages of emotion elicitation in response to auditory stimulation. He proposes that the process may start with various (1) *Reflexive Responses*, including the orienting

response, the startle reflex, defensive reflex, and reflex-like reactions based on various over-learned perceptual schemata. Thus, an unexpected bang of a door is marked physiologically by flexing the shoulder muscles, the release of epinephrine and norepinephrine into the bloodstream, which causes increases in heart-rate and respiration, sweating, pupil dilation, and so on. These reactions may facilitate perceptual intake and protective action. At the same time, (2) *Denotative Responses* allow stimulus identification (e.g., slamming door) on the basis of passive associations. (3) *Connotative Responses* are also passively learned processes using the physical properties of timing, energy, proximity, and so on to determine what the sound is like (e.g., “forceful,” “loud”). The Reflexive, Denotative, and Connotative responses are all fast and automatic. (4) *Associative Responses* are arbitrary, learned associations that may activate an emotional response on the basis of memory (e.g., reminds me of my Dad slamming doors when upset). (5) *Empathetic Responses* identify whether a sound was generated by an animate agent and what state of mind is signaled by the sound (e.g., anger). (6) *Critical Responses* are conscious, cognitive processes that evaluate the intentions or sincerity of the agent. These may also involve self-monitoring processes concerning the appropriateness of one's own response.

These two (Scherer and Huron) accounts of the appraisal process have in common the idea that rather than being alternatives, low level and higher level processes are both operative. However, in such models the low level impetus to emotion is a reflex such as the orienting or startle reflex. In addition, there are other low level reactions that are affective or evaluative (cf. Ortony et al, 2005 on

reactive level processes), as discussed in the next section.

8. How Basic and Broadly Distributed is Affect?

Although appraisal theories concentrate on cognitive distinctions, emotion does not start there. It is a process that often begins as a very low level affective reaction, a reaction that is not yet an emotion (Barrett, 2006; Baumeister et al, in press; Berkowitz & Harmon-Jones, 2004; LeDoux, 1996; Ortony, et al, 2005). Most cognitive appraisal theories have not included a stage for such early affective reactions.

Although full blown emotional states involve multiple components, including cognition, what gets the emotional ball rolling is sometimes a very low level affective reaction. For example, people apparently respond more positively to smooth, curved objects than to objects with sharp-angled edges (Bar & Neta, 2006, see also Ortony, Revelle, & Zinbarg, in press). That preference also holds for roundish as opposed to angular faces (Zebrowitz, 1997). Some have hypothesized that sharp shapes might convey threat and round shapes, warmth (Aronoff, Woike, & Hyman, 1992).

In a related vein, lightness and darkness appear to have reliable affective values that may have both universal application and ancient origins (Meier, Robinson, & Clore, 2004). There is a similar evaluative impact of high vs. low physical location (Meier & Robinson, 2004) and high vs. low pitch in music or speech (Huron, 2002). Each of these stimulus characteristics may have an associated valence for different reasons. It seems likely, for example, that young children's preference for sweetness and aversion to bitterness might be innate,

whereas some other quite common preferences might be learned.

Beyond such specific preferences, familiar stimuli generally elicit more positive reactions than do novel stimuli, a preference that appears to be a general design feature of vertebrates. Moreover, this process is evident even at the cellular level.³ The cells of vertebrates express proteins that allow mutual recognition among the cells of a given individual. Only by inhibiting such immunological activity is it possible to transplant organs from one individual to another. Natural killer cells have evolved to achieve early recognition of normal cells undergoing alteration leading to disease. If its receptors recognize the protein of a target cell, it is treated as self, and ignored, but if it fails to recognize it as one of its own, the receptors on the killer cell send a signal to destroy the target cell. Cancer cells may down-regulate these "self" proteins so that one's own cells are no longer recognized and become targets for destruction (Greenwood, 2006).

Something similar to these cellular processes also appears in behavior. The "minimal groups" effect is a highly reliable social psychological effect (Tajfel, Billig, Bundy, & Flament, 1971). Any distinction among a collection of individuals, no matter how arbitrary, leads to a surprising degree of in-group favoritism and out-group disfavor. Such a principle is presumably also at work in xenophobia, racism, and religious intolerance. However, our point is that a "like me" vs. "not like me" criterion may be a very basic principle of evaluation apparent both at the cell level and at the level of emotional appraisal.

³ Thanks to Lydia Wraight for informative discussions on immunology and affect.

An even more general statement about the lower level nature of affective processes was recently made by Buck (March 4, 2007):

Brains, after all, are only about 0.6 billion years old, compared to the 3.5 billion year history of life on the earth; and that we have about 40% of our genes in common with microbes.... I think it is of significance that one can find in microbes genes that encode for dopamine, serotonin, norepinephrine, ACTH, many of the peptide neurohormones, etc. dating from long before the evolution of the brain. This suggests that prototypical motivational-emotional systems are design principles in the most elemental life forms.

What are the implications of such observations? What does it mean that processes analogous to those of social groups are already present at the cellular level, and that the neurochemistry of evaluation may be widely distributed among animate organisms down to the level of microbes? Since no one seems likely to seriously champion the idea of microbe emotions, it sounds like some distinction is necessary between affective processes and emotional states.

9. Appraisals in Emotion: Sequential, Dual, Chaotic, or Recursive?

We have discussed an example of a dual process model (Clore & Ortony, 2000; C. Smith et al, 1996; E. Smith & Neumann, 2005) and two sequential models (Huron, 2006; Scherer, 2001) of emotional appraisal. We turn next to another dual process model, one which distinguishes affect and emotion.

Baumeister, Vohs, DeWall, & Zhang. A dual process view has been proposed by Baumeister et al. (in press) which not only specifies two processes,

but suggests how they interact. Drawing on literature reviewed by Schwarz and Clore (1996, in press), they note that although there is abundant evidence for the influence of emotion on cognition, there is scant evidence for an influence of emotion directly on behavior. They propose that behavior is controlled in a bottom-up way by unconscious affect in a manner similar to what Winkielman, Berridge, and Wilbarger (2005) showed in their studies of how unconscious priming with happy faces stimulated thirsty people to drink more of a novel beverage.

They suggest that full blown, conscious emotions are re-representations or constructions of affectively significant situations for the purpose of remembering the lesson of that situation. They argue that human social life is vastly more complex than that of any other species, and that it requires a corresponding richness and variety of emotional representation. In their view, emotion is an elaborated, conscious state that is memorable and hence useful for self-instruction. This theoretical maneuver of drawing a sharp distinction between affect and emotion strikes us as a useful one. In addition, specifying emotion as a high level state that does not drive behavior, but which provides information to the experiencer may help resolve some of the inherent conflicts between cognitive and non-cognitive approaches to affect and emotion. On the other hand, some theorists have also suggested useful alternatives to dual process accounts, as we see next.

Barrett, Ochsner, & Gross. In some accounts, both of the processes of dual process models are handled in a single network model (e.g., Barrett, Ochsner, & Gross, in press). In such models, a psychological process may be represented by activation distributed across multiple

nodes. Network models can either be “localist” (e.g., Thagard & Erb, 2002) or “Parallel Distributed Processing (PDP)” (Wager & Thagard, 2004). In the former, each node might correspond to a given emotion or emotion instance, whereas in the latter, the nodes might correspond to elements of emotion, with an emotion emerging from their joint action. Network models operate through multiple constraint satisfaction. Each item of information in a network may constrain other items such that the overall state of the network at any given moment is emergent from these multiple constraints. With respect to appraisal theory, the solution of the multiple constraints would be a specific emotion.

Rather than representing either automatic, associative processing or controlled, rule-governed processing, Barrett et al. (in press) envision a continuum along which a given solution might represent a given combination or partially automated reaction. Processes combine componentially so that a given processing event is “conditionally automatic” (Bargh, 1997) in that it falls on the continuum from automatic to controlled. This approach is compatible with the notion of emotion emergence discussed earlier. If we think of the nodes as brain regions or perhaps as circuits corresponding to ways of representing evaluation, then a particular emotion would emerge as the best fitting solution to the constraints of the currently active goals, attitudes, perceptions, knowledge, and situational parameters. The funneling toward a solution presumably can take place very rapidly and involves both top down and bottom up processing. As the bottom up processes of constraint satisfaction take place, one may feel visited by an emotion, and when one engages in imaginative constructions of

emotional events, one may feel more like the author of one’s own emotions. In this view automatic and controlled processes have different functions within the same system rather than being two different systems.

Ortony, Norman, & Revelle. A related view has been proposed by Ortony, Norman, and Revelle (2005). They think of emotions similarly as interpreted affect or affect with a cognitive-perceptual frame. Their view is that feeling is undifferentiated positive or negative affect, and that specific emotions are transformations of feeling by appraisal. Appraisals, which are sometimes conscious, but more often unconscious, situate and make sense of affect. Feeling is generated quite automatically, and its cognitive or perceptual framing may also generally be automatic. People are necessarily aware of feeling in that the idea of “unfelt feeling” involves a contradiction in terms, but such awareness need not extend to the causes of feeling. Thus, emotions in these views are cognitively elaborated states of affective feeling.

Cunningham & Zelazo. Finally, still another alternative to dual process models are approaches in which levels of processing are iterative. Cunningham and Zelazo (2007) suggest that exposure to an object initiates an iterative sequence of evaluative processes, which they refer to as “the evaluative cycle.” In this cycle, stimuli are interpreted and reinterpreted in light of an increasingly rich set of contextually meaningful representations. Evaluations based on few iterations of the cycle might be unconscious and automatic, whereas evaluations based on additional iterations become relatively reflective. Thus, implicit evaluations have fewer iterations and recruit fewer

processes than explicit evaluations (Cunningham & Zelazo, 2007).

After initial affective reactions fire, they propose that sensory information may be reprocessed. Then, after more detailed stimulus identification, the information is again sent to the amygdala. In addition, one's own visceral reactions may be reprocessed, so that the autonomic state also becomes cortically represented. At each stage, the amygdala may be used again, reacting to ever more detailed information with each iteration. In general, then, they view information processing as a series of recursive feedback loops that involve additional regions of the cortex as the process continues. With continual interaction of limbic and cortical areas, evaluations that start out as automatic become situated and progressively refined. In short, they become emotions.

Such an iterative model helps sharpen our notion of implicit and explicit processes. There is a tendency to think of implicit emotional processes and attitudes as unconscious versions of exactly what we see in conscious, explicit versions. Thus, when IAT measures of attitude disclose implicit racial attitudes, for example, or research shows amygdala activation among white participants in response to black faces, people may think of these reactions as isomorphic with explicit and fully formed attitudes or prejudices except for being unconscious. There is a tendency to see the conscious awareness as solely regulatory; as suppressing the socially unacceptable racist attitudes lurking within.

An iterative model suggests a different account. The amygdala is sensitive to novelty and violations of expectation. For most white research participants, black faces are non-

normative. The presented image is likely to be processed and reprocessed, and each time, the amygdala receives a more and more differentiated form of the same information. The explicit, fully elaborated attitude is probably not the same as whatever is pointed to by response times on the IAT, and the explicit, fully elaborated emotion is also not the same thing as the initial subcortical and neurochemical reactions of affect. They are the same thing only in the sense that the block of marble that Leonardo selected for his statue of David was the same thing as the statue that emerged from it. Both are made of exactly the same material, but the latter has a very different form as a result of being processed and reprocessed many times. In a similar way, affect and emotion are made of the same stuff, but they have very different forms as a result of similarly iterative processing.

Summary and Conclusions

In this chapter, we addressed several questions about emotion and appraisal with a focus on the process of emotion appraisal rather than on the structure of appraisal. We argued that some kind of appraisal or evaluation is a necessity, since emotions are inherently about various kinds of goodness or badness (Ortony, et al, 1988). The issue of primary interest concerns how such evaluations are made. In the 1980's Lazarus and Zajonc argued about whether affect and emotion required cognitive appraisals or not. It was an exchange that was more heated than illuminating, because critical terms were often used in different ways. In the end, both Lazarus and Zajonc were correct, but they were talking about different things. In general, cognitive theorists have focused on full blown emotional states involving subjective experience, whereas critics have often focused on low level,

nonconscious, automatic processes. Both believe they are explaining emotion, but it might be more accurate to say that the latter are studying undifferentiated affect (Ortony et al., 2005), whereas the former are studying emotion. If so, then an important task is to ask how these fit into a single processing model. Leading up to that task, we asked questions about the nature of emotion as well as of appraisal and the appraisal process.

Much research has been inspired by the assumption that emotional life issues from a small number of basic emotions, which are defined by distinctive physiology and neurology and marked by distinctive feelings, expressions, and actions. A failure to find the kind of coherence implied by that model might imply either a limitation of method or of conceptualization. We have focused on alternative possible conceptualizations, both for the emotions themselves and for the appraisal processes that help differentiate them. The emotions were treated as emergent states from partially redundant affective representations across multiple components. We contrasted this emergence model, in which physiology, expression, cognition, and so on are constituents of emotion, with the traditional latent trait model, in which these are indicators of an underlying emotion. Taking the view of these as constituents, we end up in agreement with William James' dictum that we are "angry because we strike" and "afraid because we tremble."

In an examination of the idea of appraisal, we suggested that the concept of appraisal should probably be expanded in recognition of the fact that appraisals are often as much perceptual as cognitive, and as much dictated by the topography of situations as by mental action. Still, the central focus of the chapter was on

conceptions of appraisal process. We presented one example of a dual process model (Clore & Ortony, 2000; C. Smith et al, 1996; E. Smith & Neumann, 2005). Based on Sloman's (1996) distinction between associative vs. rule-based reasoning, we suggested that emotions could arise either from rule-based processing (e.g, Roseman, 2001) or by reinstatement (e.g., Freud, 1900).

We reviewed the huge impact of LeDoux's (1996) proposal of a low route to emotion without cortical involvement, and noted critical reviews that cast doubt on the relevance of that particular pathway for human emotion. However, we noted that the work has done much to stimulate the study of subcortical contributions to emotion.

We next reviewed two sequence models of emotional appraisal (Huron, 2006; Scherer, 2001), which propose that emotional processes are often initiated by reflexes such as the startle or orienting reflex, which activates appraisal processes. In the next section, we reviewed low level affective reactions, including preferences for curved vs. jagged lines (e.g., Bar & Neta, 2006), and the evaluative implications of lightness and darkness (Meier, et al, 2004) and of high vs. low pitch (Huron, 2006). We also noted reactions to novelty vs. identity present even at the cellular level, which are perhaps continuous with behavioral reactions at the level of human groups. It was also noted (Buck, March 4, 2007) that some of the neurochemical bases of affective reactions are present even in microbes, suggesting a surprising continuity of affective processes at all levels.

The observations of amazingly low level affect-like processes make it clear that theorists must distinguish emotions

from the affective reactions which are their seeds. Hence, we reviewed several models that make this distinction one way or another, including a dual process model (Baumeister et al, in press), a parallel constraint model (Barrett, et al., in press), a sequence model (Ortony, et al, 2005), and an iterative process model (Cunningham & Zelazo, 2007).

In the end, the model of emotion and emotional appraisal that we entertained is different in many respects from the received model. It emphasizes emotions as emergent constructions rather than as

latent entities, it makes a sharp distinction between affective reactions and emotions, and it sees appraisal as an iterative process. Reflexes and low level affective reactions often get the emotional ball rolling. These undifferentiated states are then refined, situated, re-evaluated, and re-represented. The results are the rich and nuanced emotional states that mark the important occasions and turning points in people's lives, that embody people's aspirations and fears, and that are capable of motivating their best and worst actions.

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