

# Core Affect and the Psychological Construction of Emotion

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At the heart of emotion, mood, and any other emotionally charged event are states experienced as simply feeling good or bad, energized or enervated. These states—called *core affect*—influence reflexes, perception, cognition, and behavior and are influenced by many causes internal and external, but people have no direct access to these causal connections. Core affect can therefore be experienced as free-floating (mood) or can be attributed to some cause (and thereby begin an emotional episode). These basic processes spawn a broad framework that includes perception of the core-affect-altering properties of stimuli, motives, empathy, emotional meta-experience, and affect versus emotion regulation; it accounts for prototypical emotional episodes, such as fear and anger, as core affect attributed to something plus various nonemotional processes.

Most major topics in psychology and every major problem faced by humanity involve emotion. Perhaps the same could be said of cognition. Yet, in the psychology of human beings, with passions as well as reasons, with feelings as well as thoughts, it is the emotional side that remains the more mysterious. Psychology and humanity can progress without considering emotion—about as fast as someone running on one leg.

I hope to clear away some of the mystery in the study of emotion by advancing a conceptual framework, pitched at a psychological level, for emotion and all other emotionally charged occurrent events. Admittedly, few psychologists see any need for a new framework because we already have one: The concept of emotion defines the field by specifying, however vaguely, the set of events that any theory of this topic is required to explain. A list of everyday words such as *fear*, *anger*, and *happiness* divides emotion into categories—and there begins a periodic table of emotional atoms.

The concepts of emotion, fear, anger, and so forth are parts of a folk theory inherited from human herding and farming ancestors. These concepts have long provided predictions and understanding and are now a part of common sense. They are embedded in psychologists' questions and, as a consequence, answers. They guided psychology's initial theories on this topic. Yet the result has been called a "very confused and confusing field of study" (Ortony, Clore, & Collins, 1988, p. 2). Continuing deep controversies on fundamental questions (e.g., Lazarus, 1982; Ortony & Turner, 1990; Zajonc, 1980) have suggested that these guideposts might not have pointed in the best direction. They might be one of the sources of the mystery. People's intuitive ideas about their own

psychological processes need not be wrong, but they need not be right either. Some folk concepts are eventually forged into scientific tools; but others are too local or ill conceived for scientific purposes. Each folk concept must be scrutinized for its scientific usefulness. Every generation of psychologists has seen a prominent and respected writer come to question the scientific credentials of emotion concepts (especially emotion itself, a word for which does not exist in all languages; Russell, 1991) and the hidden assumptions that underlie them. LeDoux (1996) found no neurological basis for grouping various processes together as emotion. Öhman (1999) derived a similar conclusion from evolutionary premises: "Different emotion systems have different evolutionary histories and are better viewed as independent than as parts of a general domain of emotion" (p. 337).

The concept of emotion presents many puzzles, beginning with James's (1884) still unanswered (but interminably asked) question: What is an emotion? There is little convergence on an answer and therefore little agreement on where emotion stops and its causes and consequences begin (another perennial question). There are no formal criteria for what is and what is not an emotion. I am often left puzzled by just what a writer means when the word *emotion* appears in a statement or printed in a box in a flow chart. Also puzzling is the array of vastly different theories about the nature of emotion that have arisen. Indeed, few writers have failed to compare emotion as described by psychologists with the elephant as described by blind men in an old fable. Are emotions to be conceptualized as brain modes, actions or action tendencies, reflexes, instincts, attitudes, cognitive structures, motives, sensations, or feelings? Are they biologically fixed modules (and hence reducible to biology) or socially constructed roles (and reducible to sociology)? discrete categories or bipolar dimensions? cognitive, precognitive, or postcognitive?

The familiar concepts for types of emotion present puzzles of their own. Empirical analyses have uncovered the complexity of even such seemingly simple concepts as fear and anger (Lakoff, 1987), the meanings of which entangle the universal with the specifics of the local culture (Wierzbicka, 1999). Exact equivalents of the words for these concepts are not found in all languages (Russell, 1991). Consider the concept of fear, and recall James's imagined encounter with a bear: Alice is calmly strolling through

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the woods. A wild bear steps into her path. She is startled, utters a quick yell, freezes, and then flees. Is analysis of this prototypical case of fear really informative about all other cases to which the English word *fear* applies? Is it the same emotion Alice experienced when she first saw the film *Aliens*, even though she knew that she was in no danger, did not flee the theater, enjoyed the experience, and would pay to see it again? How would that sameness be empirically established? In what sense is Alice's reaction to the bear the same emotion as her other fears? When afraid of falling, she freezes; when afraid of what she knows is a harmless spider, she squishes it; when afraid of missing her flight, she speeds toward the airport; when afraid of a decline in stock prices, she buys bonds; and when afraid that her child is ill, she telephones her doctor. What, other than the label *fear*, do various instances of fear share with each other that they do not share with what is not fear? Pinker (1997) concluded, "Fear is probably several emotions" (p. 386). All the events covered by the word *fear* must be explained, and the concept of fear must itself be taken into account. Still, fear might not be an emotional atom (Berridge, 1999; Rachman, 1984). There may be no one scientific model that applies to all cases of fear, and only to fear.

The history of the psychology of emotion can be phrased as a dialogue between those who use everyday concepts of emotion and those skeptical of doing so. The skeptics have had little impact on the mainstream, perhaps because their statements seem to deny the obvious reality and importance of emotion (Mandler, 1997). Indeed, I have heard those who question the concept of emotion called *anti-emotion* theorists. Without everyday emotion words, how could researchers frame questions, propose answers, or even communicate with the participants in their experiments? I too must use these words to write this article. Still, I believe that it is possible to develop viable alternatives that minimize the problems while emphasizing rather than denying the importance and reality of the events now considered emotions.

This article outlines one especially parsimonious alternative framework (a new language, if you will) that limits the privileged status of everyday words. In much the way that the concept of thought is treated by cognitive psychologists, emotion is treated here as a constitutional monarch: The word *emotion* remains as a name for the general topic of discussion but is denied any real power, such as the power to determine borders. Thus, the scope of the proposed framework is broader than emotion (including states such as comfort, serenity, drowsiness, and lethargy). Gone is the assumption that all events called *emotion* or *fear* or *anger* can be accounted for in the same way. These concepts are not abandoned but are put in their proper place as folk rather than as scientific concepts, and their role limited to whatever role folk concepts actually play in emotion (and in perception of emotion in others). I begin by developing two everyday concepts—those for simple feelings of pleasure and arousal—into scientific concepts.

Treating everyday emotion concepts in this way allows an integration of seemingly conflicting theories of emotion. The proposed framework weds bipolar dimensions (via an attributional stage) to discrete categories. It incorporates, on the one hand, work on emotion as primitive and independent of cognition (Wundt, 1897; Zajonc, 1980) with, on the other hand, evidence on cognitive involvement such as attribution (Weiner, 1985), misattribution (Nisbett & Schachter, 1966; Schwarz & Clore, 1983), prototypes (Fehr & Russell, 1984), appraisal (Lazarus, 1982; Ortony et al.,

1988; Smith & Ellsworth, 1985), and goals (Carver & Scheier, 1990; Mandler, 1984). My hope is to achieve what Schachter and Singer (1962) set out to accomplish: a synthesis of (a) James's (1884) insight that emotion involves a self-perception of automatic processes with (b) modern evidence on the processes involved. The proposed framework draws on many prior theories but reassembles them in a novel way. It insists on rather than denies the reality and significance of emotion, finds a place for everyday vocabulary, finds a place for both biological and cultural levels of analysis but reduces psychology to neither, and might just offer a synthesis in the dialectic between the undeniable thesis of emotion and the persuasive antithesis of the so-called anti-emotion skeptics.

This article is divided into two parts. Part 1 summarizes the proposed concepts and propositions without needed qualifications or support. It takes a deductive form, first describing the most basic constituents at a psychological level and then building up to more complex events. Table 1 lists the basic technical concepts.<sup>1</sup> The events described in Table 1 are all relatively brief occurrent events (rather than summaries of or dispositions toward occurrent events). The definitions given are prescriptive (rather than descriptive of anyone else's use of these words or phrases). Table 2 lists secondary concepts that help bridge to a more familiar manner of speaking. It shows how the technical concepts of Table 1 can be used to define various emotion-related events. (Concepts for most nonemotional processes such as perception, attribution, and categorization are not defined or explicated.) Part 2 adds qualifications, explanations, and, especially, an evidentiary base. Although the framework potentially covers all emotion-related events, the focus in this article is on how it accounts for what Panksepp (1998) called the "blue-ribbon emotions" (p. 337; I call them *prototypical emotional episodes*)—those examples such as Alice and the bear that exemplify the concept of emotion.

## PART 1: A PRÉCIS OF THE CONCEPTUAL FRAMEWORK

### A Search for Primitives

My first step was to search for elemental—but still psychological—building blocks. Any conceptual framework describes how all the varied manifest examples in a domain are built from primitive elements, as few in number as possible. For example, fear, anger, and other so-called "basic" emotions serve as primitives in important and valuable theories. These theories thus use the everyday words *fear*, *anger*, and so on as scientific concepts.

One problem in using such concepts as fear as psychological primitives is that they imply a cognitive structure (Ortony et al., 1988). An emotion is typically about something: Alice was afraid *of the bear*, or more precisely, of the bear attacking and harming her. Philosophers of mind generally teach that an emotion necessarily has cognitive content, or, more technically, that it has an "intentional" object (Dennett, 1987; Searle, 1982; R. C. Solomon, 1976): I'm angry *at you*, in love *with you*, or afraid *of you*; in these

<sup>1</sup> By technical, I mean those concepts for which definitions must be prescribed and then honed with scientific analysis and evidence. Definitions for folk concepts must be discovered in everyday usage. Secondary concepts bridge the gap between these two.

Table 1  
*Prescriptive Definitions for Five Technical Terms*

| Term              | Definition   | Comment  |
|-------------------|--|--|
| Core affect       | A neurophysiological state that is consciously accessible as a simple, nonreflective feeling that is an integral blend of hedonic (pleasure–displeasure) and arousal (sleepy–activated) values | Core affect per se is Object free (free-floating), but through attribution can become directed at an Object. Level of consciousness is primary (Farthing, 1992). |
| Affective quality | The ability to cause a change in core affect   | Describable in terms of the same two dimensions as core affect.  |
| Attributed affect | Core affect attributed to an Object  | (a) Isolated from any judgment of the reality of the Object. (b) Attribution is typically quick and automatic but can be deliberate.                             |
| Affect regulation | Action aimed directly at altering core affect  | This process does not rely on the Object.  |
| Object            | The person, condition, thing, or event at which a mental state is directed   | An Object is a psychological representation, and therefore mental states can be directed at fictions, the future, and other forms of virtual reality.            |

examples, the emotion is directed at you, and you are the intentional object (shortened here to *Object* with a capital *O*).

Oatley and Johnson-Laird (1987) argued that an emotion directed at an Object is a complex event, not a primitive element. Instead, they sought primitives in emotional processes that can be free of Objects (occur in free-floating form) and therefore free of the cognitive structures implied. They proposed a set of five primitive but Object-less categories. In this way, they created a theory that accounts for the close relation between mood and

emotion (Object-less and Object-directed versions, respectively, of the same processes). This article follows their lead in searching for primitive concepts in emotional processes that can exist without Objects.

An empirically well-established solution to Oatley and Johnson-Laird's (1987) search has come from the long research program on emotion from a dimensional perspective. Much evidence points to the Object-less dimensions of pleasure–displeasure (pleasure or valence) and activation–deactivation (arousal or energy) as prim-

Table 2  
*Prescriptive Definitions for Secondary Concepts*

| Term                           | Definition  | Comment  |
|--------------------------------|---|--|
| Mood                           | Prolonged core affect with no Object (simple mood) or with a quasi-Object   | This concept is fuzzy because neither duration nor degree of stability is defined.                                       |
| Empathy                        | Attributed affect caused by mental simulation of the experience of another  | The everyday term <i>empathy</i> likely implies a socially desirable affective response as well.                         |
| Displeasure motive             | Attributed affect where the core affect is displeasure and the Object is a specific deprivation                               | Other mechanisms for motivation are also likely.   |
| Prototype                      | A cognitive structure that specifies the typical ingredients, causal connections, and temporal order for each emotion concept | Fear and other emotion concepts define categories the borders of which are fuzzy and that possess an internal structure. |
| Emotional episode              | Any occurrent event that sufficiently fits a prototype to count as an instance of that emotion                                |  |
| Prototypical emotional episode | An emotional episode that matches the prototype closely   |  |
| Emotional meta-experience      | Perception of one's own emotional episode in terms of one or more specific emotion categories                                 | Mediated by cognitive categories. This subjective experience is a secondary level of consciousness (Farthing, 1992).     |
| Emotion regulation             | Attempts to alter the category of emotion in which one finds oneself  | Mediated by emotional meta-experience.   |

*Note.* Object = the person, condition, thing, or event at which a mental state is directed.

itive, universal, and ubiquitous. The combination of these two dimensions—here called *core affect*—is the first primitive of the proposed framework. Core affect describes moods but is also the core of all emotion-laden occurrent events. Indeed, to varying degrees it is involved in most psychological events and is what makes any event “hot” (i.e., emotional). Perception of the pleasant–unpleasant and activating–deactivating qualities of stimuli—here called *perception of affective quality*—is the second primitive. Whereas core affect exists within the person (it is Alice who feels upset), affective quality exists in the stimulus (it is the bear that is upsetting). Perception of affective quality is a “cold” process, made hot by being combined with a change in core affect. These primitive processes, alone or combined with information processing and behavioral planning, then account for all the myriad manifestations and influences called *emotional*.

### Core Affect

Core affect is that neurophysiological state consciously accessible as the simplest raw (nonreflective) feelings evident in moods and emotions. It is similar to what Thayer (1989) called *activation*, what Watson and Tellegen (1985) called *affect*, what Morris (1989) called *mood*, and what is commonly called a *feeling*. At a given moment, the conscious experience (the raw feeling) is a single integral blend of two dimensions, hence describable as a single point on the map of Figure 1. The horizontal dimension, pleasure–displeasure, ranges from one extreme (e.g., agony) through a neutral point (adaptation level) to its opposite extreme (e.g., ecstasy). The feeling is an assessment of one’s current condition. The vertical dimension, arousal, ranges from sleep, then drowsiness, through various stages of alertness to frenetic excitement. The feeling is one’s sense of mobilization and energy. Some names for regions of Figure 1 are emotional (*elated*, *upset*, *depressed*) and some are not (*tense*, *calm*, *serene*, *comfortable*, *fatigued*, *bored*, *drowsy*). Names also differ in the degree to which they denote core affect. At one end of a continuum are names that denote nothing else (feeling *good* or *bad*, *sleepy* or *wide awake*); at the other end are names that merely hint at core affect. Most are in between. For example, *pride* can be thought of as feeling good

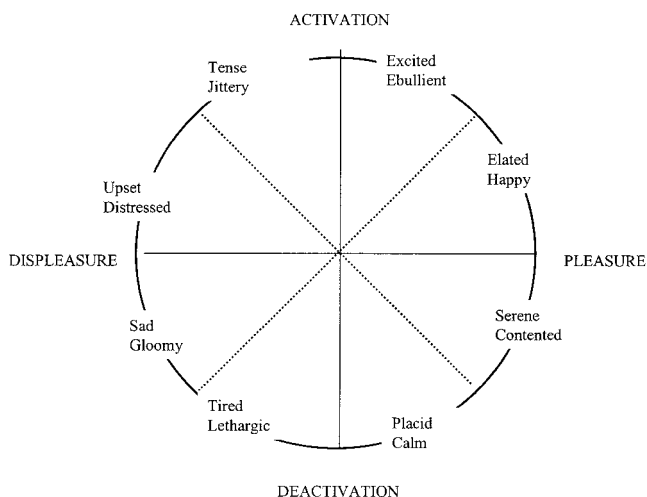


Figure 1. Core affect.

about oneself. The “feeling good” is core affect and the “about oneself” is an additional (cognitive) component.

Core affect is primitive, universal, and simple (irreducible on the mental plane). It can exist without being labeled, interpreted, or attributed to any cause. As an analogy, consider felt body temperature. You can note it whenever you want. Extremes can become very salient. Felt temperature exists prior to such words as *hot* or *cold*, prior to the concept of temperature, either in folk or scientific theory, and prior to any attribution about what is making you hot or cold. The subjective experience is simple and primitive and therefore irreducible to anything else psychological. Science can seek its causes and consequences, but further analysis of felt temperature itself takes us, not to constituent psychological atoms, but to biology.

As with temperature, core affect is simple at a subjective level but complex at the biological level. The biological mechanisms of core affect are beyond the scope of this article (as is what Chalmers, 1996, called the hard problem of consciousness: how neural states yield conscious states). Still, it is encouraging that, from a biological perspective, different researchers have proposed similar or related dimensions. The subjective experience and its neurophysiological counterpart are not separate events but two sides of the same coin.

As consciously experienced, core affect is mental but not cognitive or reflective (Zajonc, 2000). Cognitive events, such as beliefs or percepts, are intrinsically about something: They have Objects. In contrast, core affect per se is not about anything. That is, core affect can be experienced in relation to no known stimulus—in a free-floating form—as seen in moods. Winkelman, Berridge, & Wilbarger (2000) provided evidence that the same core affect (induced through subliminal stimulation) can emerge into consciousness as a mood in some circumstances but as liking for a beverage in other circumstances.

A person always has core affect: Picture a single point that moves about in Figure 1, responding to events internal and external. Core affect can be neutral (the center point), moderate, or extreme (the periphery). Changes can be short lived or long lasting (as in a clinical depression). Intense core affect can be the focus of consciousness, but milder core affect is typically a part of the background of the person’s conscious world. Change in core affect, in proportion to its rapidity and extent, fills consciousness. When the feeling weakens or stabilizes, it recedes into the background. When neutral and stable, perhaps core affect disappears altogether from consciousness.

### Causes

The process of changing core affect is not fully understood, but the important point here is the complexity of the causal story. There are genetically based individual differences in average levels of core affect, its volatility, and its responsiveness to types of stimuli (e.g., Lykken & Tellegen, 1996). There are also internal temporary causes such as activity of immune cells, diurnal rhythms, and hormone changes. External causes work on this floating baseline. Occasionally, one obvious external cause overwhelms all others (the bear caused Alice’s core affect to change from tranquility to distress). Core affect depends on all the information possessed about the external cause, from its initial sensory registration to full cognitive processing. Core affect is especially



subject to the drama taking place in consciousness, whether based on reality (perceiving the bear) or, according to the virtual reality hypothesis, fiction (watching *Aliens*). (See *The Virtual Reality Hypothesis*, below.) Core affect can be manipulated by drugs: stimulants, depressants, euphorants, and dysphorants. More typically, however, changes in core affect result from a combination of events, such as the cumulative stresses of a week on the job. Some of these causes are beyond one's ability to detect consciously, such as ionization in the air and infrasound.

A key to understanding core affect is that people have no direct access to these causal connections and limited ability to track this complex causal story. Instead, a person makes attributions and interpretations of core affect. Sometimes the cause is obvious, but at other times, one can undergo a change in core affect without knowing why.

### Function

Core affect is a continuous assessment of one's current state, and it affects other psychological processes accordingly. A change in core affect evokes a search for its cause and therefore facilitates attention to and accessibility of like-valenced material. Core affect thus guides cognitive processing according to the principle of mood congruency. The more positive core affect is, the more positive events encountered or remembered or envisioned seem—provided that the core affect is not attributed elsewhere (Schwarz & Clore, 1983). Core affect is part of the information used to estimate affective quality and thus is implicated in incidental acquisition of preferences and attitudes. Core affect influences behavior from reflexes (Lang, 1995) to complex decision making. One can seek to alter or maintain core affect directly—*affect regulation*—from the morning coffee to the evening brandy. People generally (but not always) seek behavioral options that maximize pleasure and minimize displeasure. Decisions thus involve predictions of future core affect (March, 1978). Core affect is involved in motivation, reward, and reinforcement.

### Affective Quality

As people scan their surroundings, they do not find a jumble of stimulation, patches of light, and bursts of sound. Instead, they typically find a coherent pattern of meaningful objects and events in a stable environment. Someone enters a pub and observes a friend sitting there—or, more precisely, a rousing pub and a boring friend sitting calmly. Objects, events, and places (real, imagined, remembered, or anticipated) enter consciousness affectively interpreted. The perception of the affective qualities of all the stimuli typically impinging at any one time (how pleasant, unpleasant, exciting, boring, upsetting, or soothing each is) then influences subsequent reactions to those stimuli. Objects and events all have affective qualities, the perception of which is as much a part of contact with the external world as perception of nonaffective qualities. Indeed, just as sensation, perception, and cognition cannot be cleanly distinguished from one other, perception of affective quality is another part of this processing of information.

Using a variety of terms (*evaluation*, *automatic evaluation*, *affective judgment*, *appraisal*, *affective reaction*, *primitive emotion*), theorists have pointed to something like what I am calling perception of affective quality as a ubiquitous and elemental

process (Bargh, 1997; Cacioppo, Gardner, & Berntson, 1999; Zajonc, 1980). This list of different terms is interestingly ambiguous as to whether the process is affective or cognitive. Here, affective quality is a property of the stimulus: its capacity to change core affect. Perception of affective quality is a perceptual process that estimates this property. It begins with a specific stimulus and remains tied to that stimulus.

Although historically and logically perception of affective quality depends on core affect, these two entities must now be conceptually distinguished from one another. Core affect can change without reference to any external stimulus, and a stimulus can be perceived as to affective quality with no change in core affect—it is then cold and detached, as when a depressed patient admits that the sunset is indeed beautiful but is still not able to alter a persistently depressed mood. To perceive affective quality is to represent rather than to experience core affect. Nevertheless, the two processes are linked empirically, although sometimes in complicated ways. The paradigm case is the use of core affect to estimate affective quality. In *mood-congruent priming* (Forgas, 1995), core affect makes available like-valenced information; feeling happy, one processes more positive information about the Object and hence overestimates its pleasantness. In *misattribution* (Schwarz, 1990), a change in core affect due to one source is misattributed to another; feeling happy, the person mistakenly attributes the happy feelings to the Object and therefore perceives the Object to be more pleasant than it would otherwise seem. Even when linked, the two can bear different relations: being served a meal perceived as pleasant produces pleasure; being deprived of that same pleasant meal produces displeasure.

### Attributed Affect

As the two primitives of the proposed framework, core affect and perception of affective quality (either alone or combined with nonemotional processes) define everything else. For example, *mood* is defined as prolonged core affect without an Object, *affect regulation* as action aimed directly at altering or maintaining one's own core affect without reference to an Object. Names could be given to various such combinations, but here I turn to the most important: *attributed affect*.

In an attributed affect, a change in core affect is linked to its perceived cause (person, place, event, physical object, or state of affairs). Sometimes the cause is obvious; sometimes a search is required; sometimes mistakes are made. Whatever cause is identified becomes the Object. Attributed affect is thus defined by three necessary and, when together, sufficient features: (a) a change in core affect, (b) an Object, and (c) attribution of the core affect to the Object. The Object potentially includes the full meaning and future consequences of that event and has a perceived affective quality. Attribution is the perception of causal links between events and allows room for individual and cultural differences. Attributions usually seem correct to the attributor, but research has demonstrated misattributions. Attributed affect has two functions beyond those of core affect. First, it guides attention to and behavior directed at the Object. Second, it is the main route to the affective quality of the Object.

Despite this complex definition, attributed affect is, phenomenologically, simple and very common: afraid of the bear, feeling sad at a loss, liking a new tune, feeling uncomfortable from the

heat, feeling sympathetic to a friend's woes, and on and on. Put more generally, attributed affect covers many topics, including those called *affective reactions*, *liking*, *displeasure motives*, and *empathy*. Many of these would fail to qualify as blue-ribbon emotions (and are no less important for that), but some would.

### Emotional Episode

The processes postulated so far—core affect, perception of affective quality, and attributed affect—describe many everyday feelings and are unlikely to be too controversial. Yet they present the psychology of emotion with a pivotal theoretical question: If these processes exist, then what more must be postulated to account for clear, full-blown, blue-ribbon emotions, what I call prototypical emotional episodes? Must fear, anger, and other so-called basic emotions be postulated as additional primitive elements? If not, how can their seeming unity, automaticity, and division into discrete categories be accounted for? Here, I pursue a stronger, more interesting and likely more controversial claim, namely, that the processes postulated so far, plus blatantly non-emotional processes, can account for all emotional episodes.

Some examples of core affect and attributed affect qualify as reasonable examples of emotion, even if not as prototypical ones. Even without any other features, a simple core affect of pleasure may qualify as the emotion of happiness, a core affect of displeasure as a case of sadness. The combination of pleasure and high arousal may qualify as elation, the combination of displeasure and high arousal as anxiety. Indeed, core affect alone accounts for emotion in the way a dimensional theory does. Nevertheless, by themselves, pleasure and arousal do not fully account for most emotional episodes. Specifically, I acknowledge that my own dimensional model of emotion (Russell, 1980) does not provide a sufficiently rich account of prototypical emotional episodes. For example, that model fails to explain adequately how fear, jealousy, anger, and shame are different and how observers can distinguish them. The dimensional perspective must be integrated with the categorical perspective, and that is one aim of the current analysis.

### Components of an Emotional Episode

As recognized in many theories, an emotional episode consists of components. Here is a prototypical case.

#### Antecedent Event

There is an obvious external antecedent event. Although the antecedent might seem simple, the complexities of the perceptual-cognitive construction of a psychological representation of any external event are well known.

#### Affective Quality

The antecedent is perceived in terms of its affective quality.

#### Core Affect

The antecedent dramatically alters core affect. Although the person enters the episode with a certain core affect, as the antecedent event begins to be registered, core affect begins to change, perhaps sometimes before the antecedent is consciously perceived.

Core affect continues to change as the episode unfolds. Core affect influences other components in the emotional episode.

#### Attribution

Core affect is attributed to the antecedent, which becomes the Object. In the resulting attributed affect, the person has this salient experience: That Object is making me feel the way I now feel.

#### Appraisal



The perceptual-cognitive processing of the Object continues, assessing such qualities as its future prospects, its relevance to one's goals, its causal antecedents, and so on. On the principle of mood congruency, judgments and information congruent with core affect are more accessible.

#### Instrumental Action

Action is directed at the Object. The Object is a problem (or opportunity) that requires a behavioral solution. Pleasure-displeasure quantifies the problem and may include a general preparation for approach versus withdrawal. Activation is a general mobilization in preparation for vigorous action. The specific action taken depends on an assessment of current circumstances and resources, the creation of a goal, and the formation of a plan to reach that goal. (There is no separate class of "emotional behavior;" instead, any form of behavior can be recruited. No specific action or action tendency is produced by or is necessary for a specific emotion.)

#### Physiological and Expressive Changes

Facial, vocal, and autonomic changes occur and are accounted for (a) by core affect and (b) as part of, preparation for, or recovery from instrumental action. (There is no nonverbal expressive signal or pattern of autonomic nervous system activity unique to each discrete emotion.)



#### Subjective Conscious Experiences

In addition to the conscious experiences already mentioned (e.g., core affect and perception of the Object's affective quality), there is a flood of metacognitive judgments: a sense of urgency, indecision, confusion, uncertainty, and incredulity; much of the episode seems beyond deliberate control. These metacognitive judgments are made hot by being accompanied by core affect.

#### Emotional Meta-Experience

There is an additional and separate subjective conscious experience: The person experiences a specific emotion. (At some point, Alice might notice that she is afraid.) This event—emotional meta-experience—is thus categorical. It is not an introspection and naming of an internal event, the fear. Instead, it is a self-perception (James, 1884): a categorization of one's state. The features on which the categorization is based are the other components of the episode (antecedent event, core affect, etc.). The categories involved are those specified by each everyday folk concepts underlying the words *fear*, *anger*, *jealousy*, and so on—for speakers of

English. Those who speak other languages may have concepts that are in some ways similar but in some ways different. Although it is necessary at this point to reintroduce the concepts of fear, anger, and so on, they remain folk concepts. Each category is thought of as structured according to prototype theory (Fehr & Russell, 1984).

### Emotion Regulation

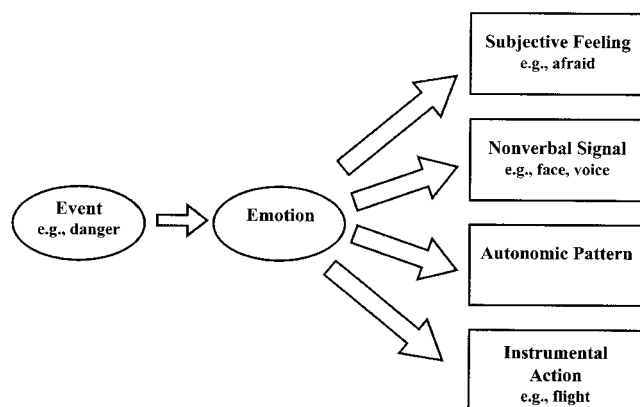
By categorizing oneself as, for example, afraid, one helps place one's current state and situation within a broader body of knowledge, including social norms and roles. Emotion regulation is the deliberate attempt at self-control based on so categorizing oneself.

### A Final Note

Bear in mind that the preceding list and its claims concern what typically happens in prototypical cases. In nonprototypical and borderline cases, the story can be quite different. For instance, core affect can be extreme before rather than after the antecedent appears (as in displacement); one can enjoy what one appraises as dangerous (thrill seeking); the antecedent need not be the Object (misattribution); appraisals can be atypical (fear of Objects known to be harmless), and so on.

### Psychological Construction of the Emotional Episode

The traditional view of an emotional episode is too nebulous and implicit to characterize precisely, and psychologists have developed different versions, but, generally, an emotion is thought of as what James (1884) disparagingly called an *entity* and what Rachman (1984) called a *lump*. This assumption is captured in Figure 2 in a generic version of a commonly encountered flow chart depicting a causal chain centered on the emotion. The antecedent causes the emotion, which causes all its various "manifestations." More modern theories might construe the emotion at the center of the chain as a hypothetical construct or as a neural module, but the effect is much the same. This traditional theory is tailor-made to account for coherence among the components and for the division of emotion into discrete categories. The emotion categories are fixed ahead of time, which accounts for the speed of their elicita-



**Figure 2.** The traditional view in which emotion is an event that mediates between an antecedent and its various manifestations. Arrows represent causal direction.

tion. Concepts such as fear and anger thus serve as explanations for observed manifestations.

The present account, illustrated in Figure 3, consists of two steps. In the first, the same manifest components occur, although none are caused by or accounted for by an event that could be called *fear* (or any other type of emotion). In the second step, these components are observed and categorized. The observer can be the person having the emotion (in which case, this step is equivalent to emotional meta-experience), a witness, or a scientist. They need not always agree with one another. The categories involved are based on whatever concepts the observer brings to bear. For most readers, the concepts are those labeled by familiar English words such as *fear* and *anger*. These concepts (and hence the division of emotion into discrete categories) thus enter the account only when the emotional episode is observed.

It is now possible to provide some more formal definitions. An *emotional episode* is an event that counts as a member of an emotion category, such as that labeled *fear*. A prototypical emotional episode is an event that counts as an excellent member. The proposed approach is called *psychological construction* to emphasize that the sequence of events that make up any actual emotional episode is neither fixed by biological inheritance from the human evolutionary past (as basic emotion theories have it) nor fixed by social rules or categories (as social constructionist theories have it) but is constructed anew each time to fit its specific circumstances. Psychological construction differs from the traditional view in several related ways.

### Categories

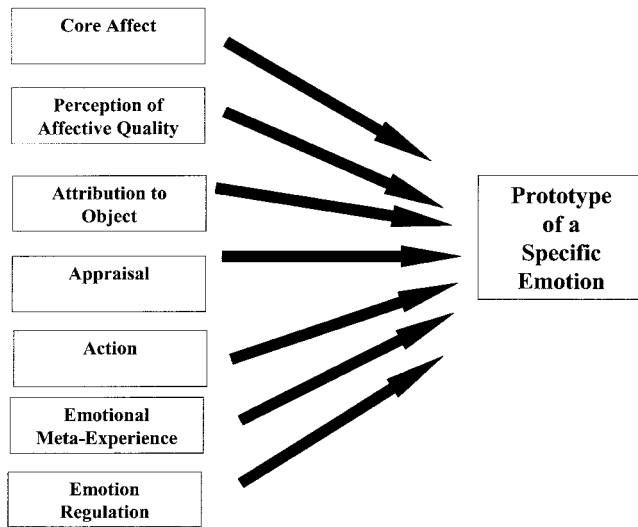
In the traditional view, categories such as fear and anger are well defined. In the present account, they are not defined by necessary and sufficient features. The set of events picked out by the English word *fear* is not a biologically given category. Indeed, the present analysis predicts that there is no neural circuit, peptide, or other biological marker that is unique to fear (or any other discrete emotion). Instead, to categorize is to note a resemblance between observed components and a mental representation, which is here thought of as a mental script. Resemblance is a matter of degree rather than either-or. The borders between noninstances, instances, and prototypical instances are very fuzzy. Resemblance is an external fact about the components, not an internal mechanism that joins them into a package.

### Dissociations

Because, in the traditional view illustrated in Figure 2, the various "manifestations" of a specific emotion all have the same cause, they all co-occur, unless specifically and individually prevented from doing so. They are thus predicted to be highly intercorrelated. In contrast, in the present account, the components have no one common cause and are relatively dissociated.

### Ecology of Emotional Life and Resemblance to the Prototypes

In the traditional view, there is a sharp boundary between emotions and nonemotions; emotions either occur or they do not. Here, in contrast, the prototypical case described above is rare, less



**Figure 3.** The proposed alternative to the traditional model. An observer notes a resemblance between a pattern of components and a cognitive prototype for an emotion. Arrows represent resemblance.

prototypical cases more common. Each of the components listed can occur alone. Sometimes, pairs or larger groupings of components occur. Occasionally, the various events happen to co-occur in a pattern that fits the prototype. Because of dissociations among the components, a huge variety of combinations occur, which therefore vary in their resemblance to the prototype. There are many ways to resemble the prototype, and therefore no one component is necessary.

### Accounting for Components

In the traditional view, the manifest components are accounted for by the emotion. (Alice fled because she was afraid.) Here, that explanation is not available. Figure 3 includes no box in which is printed the word *emotion*. Fear is not an entity. Instead, each component is accounted for in its own separate way, by the antecedent event, core affect, perception of affective quality, and various nonemotional processes. Some of the components occur quickly and automatically, some less so. (Historically, debate centered on the question of which of the components is the emotion. That question does not arise in the approach taken here.) Although the components influence one another, they cannot be ordered in an invariant sequence. They are ongoing and often temporally overlap. The reader might wonder why Figure 3 fails to provide a flow chart showing how one component leads to another (e.g., antecedent → appraisal → core affect). The commonsense concept of emotion, and the prototypical case described above, would lead one to expect to find such a flow chart. However, nonprototypical cases are just as real, and they too count as fear or some other emotional episode, but they would violate any such model.

### Mechanism

My final assumption is a consequence of the others: There is no need to postulate a mechanism that ties all the various components

into one package. Prototypical emotional episodes are coherent packages, not because they stem from one mechanism, but because they are just those cases selected by an observer on the basis of their resemblance to a coherent package: the folk concept.

### Conclusion

Like any science, psychology must decide on the fundamental elements in its ontology. Are fear, anger, and the other discrete emotions to be among them? Or, are these plainly important and real events to be explained as configurations of other, more fundamental elements? In other words, are discrete emotions like the stars, long recognized as fundamental astronomical entities, or are they more like the Big Dipper and other constellations? Constellations were once thought fundamental entities (indeed, powerful forces) but are now seen as merely happenstance configurations, seen from an arbitrary perspective and with no deep role to play in astronomy. Different cultures historically recognized somewhat different constellations.

Just as human beings are amateur astronomers, they are amateur psychologists. Long ago, humans developed a network of concepts (a folk theory) that includes such dubious dichotomies as mind–body, nature–nurture, and reason–emotion. Human ancestors developed the concepts of fear, anger, and other emotions to account for occasional dramatic events that seemed to be qualitatively different from normal thinking and acting. Different cultures recognized somewhat different emotions. Joy, fear, anger, and other discrete emotion concepts have the weight of tradition and everyday experience behind them. They are concepts that shape the way people view themselves and others. These concepts configure psychological reality. They are part of spoken language, and humans stand nearly speechless without them. The analysis here suggests that these concepts have empirical standing and provide understanding and prediction. Like many human concepts, they are defined by their prototypical examples.

When cognition is considered slow, cold, conscious, and rational, when action is considered deliberately planned by a free will, then one must look elsewhere to explain fast, involuntary, and hot emotional episodes such as fleeing a bear. Thought is contrasted with emotion, the head with the heart and guts, ego with id, cerebral cortex with the limbic system. (For a discussion of the limbic system concept, see LeDoux, 1996.) However, once the speed, automaticity, complexity, and bounded rationality of cognition and action are recognized, and once the fundamental process of core affect is recognized, the need to postulate additional qualitatively different processes, emotional homunculi, fades.

To describe emotional life adequately it is necessary to go beyond these prototypes. The ecology of emotional life is not one of long periods of nonemotional “normal” life punctuated by the occasional prototypical emotional episode. A frugal ontology may be all that is needed: Emotional life consists of the continuous fluctuations in core affect, in pervasive perception of affective qualities, and in the frequent attribution of core affect to a single Object, all interacting with perceptual, cognitive, and behavior processes. Occasionally, these components form one of the prototypical patterns, just as stars form constellations.



## PART 2: ELABORATION, RATIONALE, AND EVIDENCE

### Core Affect

Many familiar lines of evidence point to something like core affect at the center of a person's emotional life. Indeed, Davidson (2000) said of the valence dimension that it is "present in virtually all systems that have been developed to classify emotion and motivation, ranging from comparative accounts that address phylogenetic origins (Schneirla, 1959) to studies of semantic structure (Osgood, Suci, & Tannenbaum, 1957)" (p. 371). Since before Socrates, those who have written about human nature have described the central role played by pleasure and displeasure. Psychologists have focused on the role of general arousal, although they have construed it in a variety of ways (Cannon, 1927; Duffy, 1941; Hebb, 1955; Schachter & Singer, 1962). When Wundt, Stumpf, Titchner and other early psychologists (see Reisenzein, 1992; Reisenzein & Schonpflug, 1992) introspected their conscious states, they described something like what I am calling core affect. Wundt (1897) specifically identified dimensions of pleasant–unpleasant, tension–relaxation, and excitement–calm as the basis of feeling and emotion.

Postulation of something like core affect can also be justified on more behavioral grounds. For many years, the concepts of pleasure and displeasure were shunned, but these concepts are now being seen once again in the explanation of diverse behaviors: sex (Abramson & Pinkerton, 1995), eating (Pinel, Assanand, & Lehman, 2000), aggression (Berkowitz, 1993), drug abuse (R. L. Solomon, 1977), self-esteem maintenance (Tesser, 2000), and helping behavior (Isen, 1999). A large variety of cognitive effects can be explained by variations in core affect (Ashby, Isen, & Turken, 1999; Bower, 1992; Eich, 1995; Forgas, 1995). Both descriptive and normative models of decision making require a concept of utility, which involves feelings of satisfaction or dissatisfaction (Kahneman, 1999). Decision making requires a psychological currency in terms of which disparate events can be compared (Cabanac, 1990). As Shizgal and Conover (1996) pointed out, pleasure provides the yardstick on which qualitatively different possibilities can be compared.

There is also emerging evidence for core affect from biological research. Although models and research programs differ in detail, dimensions similar to those proposed here are often encountered (Ashby et al., 1999; Berridge, 1999; Cabanac, 1990; Cacioppo et al., 1999; Davidson, 1992a, 1992b; Gray, 1994; Heller, 1990, 1993; Lane, 2000; Lang, 1979; Phillips, 1984; Rozin, 1999; Thayer, 1996). Johnston (1999) outlined the evolutionary origins of pleasure and displeasure. The rationale is formally similar to that derived from behavior. For example, disparate stimuli, including photographs and recorded sounds, influence the magnitude of the startle reflex in a way that suggests a general mechanism not tied to any one stimulus type but based on valence (Lang, 1995). The study of peripheral physiological changes in emotion (like the study of emotion itself) has been a dialectic between discrete categories and general dimensions. In a recent review of this evidence, Cacioppo, Berntson, Larsen, Poehlmann, and Ito (2000) pointed to the emergence of a general dimension of response to "hospitable (positive)" versus "hostile (negative)" stimuli (p. 179). The study of facial efference and afference has undergone the

same dialectic, and Cacioppo et al.'s (2000) review similarly pointed to the emergence of the positive–negative dimension from electromyographic data. Some writers think of pleasure as mental and of arousal as physiological (especially as activity of the autonomic nervous system). Some think of arousal as a peripheral physiological component providing an emotion's intensity, with cognition providing its positive or negative direction. In contrast, the assumption here is that both pleasure–displeasure and activation–deactivation are states of the central nervous system; both have peripheral physiological correlates and both are subjectively experienced as mental events.

Linguistic evidence leads to a similar conclusion. All known human languages provide the sentences "I feel good" and "I feel bad." Indeed, the concepts of feel, good, and bad are universal and semantically primitive (Wierzbicka, 1999). A study of the way in which emotions are described in various languages suggested that not just good–bad but also arousal are likely universal semantic dimensions of emotion (Russell, 1991). (In contrast, such words as *emotion*, *fear*, and *anger* are neither universal nor semantically primitive; Russell, 1991; Wierzbicka, 1999). Osgood, May, and Miron (1975) found similar factors of affective meaning (evaluation, activity, and potency) implicit in every one of a large sample of languages. Different languages divide the space of Figure 1 somewhat differently, just as different languages divide color space somewhat differently, but the space itself is pancultural. The hypothesis of Figure 1 is that part of the meaning of all mood- and emotion-related words in any language can be summarized by these two underlying dimensions.

### *A Structural Description of Core Affect*

Although the lines of evidence mentioned so far are suggestive and complementary, the specific model of core affect advanced here stems from psychometric research on mood and emotion conducted over the last half century. That research provides the details of an integrative and parsimonious model of core affect, as shown in Figure 1. Since the 1950s, increasingly sophisticated multivariate techniques have been used to discover an empirically based structural model of emotion and mood. Researchers started from a variety of theoretical orientations, presented participants with a variety of tasks (to imagine how they might feel in a given situation, to react to photographs or sounds, to describe their current mood, to remember a past emotion), and applied a variety of analytic strategies. A remarkably consistent finding has been two broad dimensions underlying the resulting data (see reviews by Feldman Barrett & Russell, 1999; Watson & Tellegen, 1985).

The finding of two broad dimensions is so ubiquitous, and current descriptive models so similar, that the word *consensus* is now appearing in writings on this topic (Watson & Tellegen, 1985). Recently, various prominent models (R. J. Larsen & Diener, 1992; Russell, 1980; Thayer, 1989; Watson & Tellegen, 1985) of mood, affect, and activation were shown empirically to be different descriptions of the same space (Yik, Russell, & Feldman Barrett, 1999). Russell and Feldman Barrett (1999) summarized the evidence for the model of Figure 1, including (a) the number of dimensions required, (b) possible rotation of the axes, (c) the circular ordering, and (d) the bipolarity of the axes (see also J. T. Larsen, McGraw, & Cacioppo, 2001; Russell & Carroll, 1999).

### *Limitations of the Dimensional Perspective*

The dimensional perspective is open to various well-taken criticisms (e.g., R. J. Larsen & Diener, 1992). One is that the model schematized in Figure 1 is not a model of emotion. For example, the model of Figure 1 is meant to include deactivation states (which might be described with such words as *sleepy*, *tired*, or *placid*) that are plainly not emotions. This criticism is consistent with the current abandonment of *emotion* as a technical term, with the distinction between core affect and emotional episodes, and with the hypothesis that core affect includes a range of states not covered by *emotion*. There may be no single word or simple phrase in everyday English that specifies this domain any more than technical terms in any advanced science can be translated into simple English. The rationale behind Figure 1 is not that it corresponds to an English word but that evidence points to it as a coherent domain. If, as claimed, a person is always at exactly one point in Figure 1 then no part of Figure 1 can be omitted, however that region is named in English.

A second criticism is that a dimensional account fails to differentiate between discrete emotions. Anger, fear, jealousy, disgust, contempt, embarrassment, guilt, stress, acute grief, and envy—all are unpleasant high-activation states, and all would therefore fall close to one another if placed within Figure 1. Yet the difference between any two on this list is not a little more displeasure or a little less arousal. Indeed, all the emotions just listed might occur with identical core affect. These emotions are not differentiated by pleasure and arousal. This criticism lies behind the current formulation in which core affect is only a part of an emotional episode. Differentiation requires other parts.

A third criticism is that the first dimension, ubiquitous as it may be, is ambiguous. It has been named *evaluation*, *liking*, *positive-negative*, *approach-avoidance*, *valence*, *utility*, and *hedonic tone*—and these are not all identical. Evaluation and liking imply an Object to be evaluated and liked and hence are aspects of attributed affect or of the perception of affective quality rather than of core affect per se. Positive versus negative might mean morally right or wrong, conventionally proper or improper, advantageous or not, adaptive or maladaptive. The hedonic experience of displeasure is just as adaptive as that of pleasure. Approach versus avoidance is a dimension of behavior. On the present analysis, the first dimension of core affect is a simple hedonic process that is empirically linked to, but conceptually separate from, evaluation, liking, approach, and so on.

A fourth criticism is that the second dimension, arousal, is ambiguous and fails to correspond to a single physiological process, referring instead to a variety of loosely connected activities of the autonomic nervous system. Indeed, the construct of arousal is often operationally defined as a single measure of peripheral autonomic activity (e.g., skin conductance, heart rate, or blood pressure). These measures are poorly intercorrelated (Davidson, 1978). Self-reported arousal is weakly related to any single index of autonomic arousal, although more strongly related to a composite index (Thayer, 1989). The autonomic nervous system is indeed complex, but *arousal* here refers to a state of the central nervous system experienced as a subjective feeling and with peripheral correlates.

A fifth criticism is that dimensional research relies too much on words. The reader might wonder how an article that began mired

in skepticism over folk concepts can rely heavily on an analysis of words. Like felt body temperature, core affect is an inherently nonlinguistic entity. The use of words to study core affect is pulling oneself up by the bootstraps; it is the state reported rather than the words that are important. Words are a means of communicating about, and therefore acquiring information about, core affect. Data from a variety of methods (from reflex potentiation to neuroimaging) suggest the hypothesis of core affect. These dimensions, of course, are also named with words—after all, all events and objects studied by science are named with words.

Finally, the dimensional perspective relies heavily on self-report. The data reviewed in this last section did indeed derive from self-reported moods and emotions, but, in principle, it is possible to go beyond self-report. Ultimately, self-report is no more defining than any other indicator, because scientists are relying on someone to tell them about something subjective (at a phenomenological level) or inaccessible to them (at a neural level). Not everyone is truthful, nonhumans and human babies cannot make any reports at all, and verbal reports are mediated through choice of words and influenced by other processes. Progress has already been made on various objective indicators—behavioral, cognitive, biochemical, neurological, physiological—of core affect (Bradley & Lang, 2000). Still, core affect's mental side currently provides the most straightforward access to the core affect of another in situations in which there is little incentive to lie. A theory can thus begin with, and other indicators would initially be validated against, self-report.

### *Causes*

Understanding core affect requires understanding its causes. There is a vast literature on both its immediate causes and on the origin of those causal relations, including mere exposure, habituation, and classical conditioning. Rather than review the details, I highlight several key features of the topic, especially the immediate determinants of pleasure and arousal.

A single external objective event can obviously alter core affect—for example, when Alice sees the bear, her core affect changes from tranquility to distress. In affect regulation, the person typically seeks one means to alter core affect. Single causes come easily to mind and suggest a stimulus-response analysis. (Ortony et al., 1988, and Weiner, 1985, began their accounts with a valenced reaction to a single event.) The causal story of core affect is interestingly and importantly more complex.

### *Nonstimulus Causes*

In addition to genetically based individual differences in average levels of core affect, its volatility, and its responsiveness to types of stimuli (e.g., Lykken & Tellegen, 1996), core affect is influenced by internal events. For example, following activation of immune cells by viruses or bacteria, neurons respond to alter core affect, (and perhaps as a consequence) behavior, and cognition (Maier & Watkins, 1998). Reported feelings of fatigue and lethargy during illness suggest that core affect moves toward the lower left quadrant of Figure 1. Other internal influences include diurnal rhythms, hormonal changes, endocrine dysfunction, cerebrovascular incidents, proprioceptive feedback, satiety, and nutritional deficiency. Core affect can be altered by chemicals from alcohol to

Prozac. Hunger, thirst, and other privations are subjectively felt as discomfort. High arousal states are preparations for action, whether stimulated by external events or created by adequate rest. Low arousal states are times of inaction, whether created by satiety, need for rest, or abandonment of goals.

### *Many Simultaneous Causes*

Even with external causes, it is rare that a single event overwhelms core affect. More typically, core affect responds to the continuous flow of events (persons, places, things, states of affairs). Core affect is an accounting of these events as they accumulate (Morris, 1989; Robinson, 2000; Thayer, 1989). Perhaps the rate of information flow—how fast, how unexpected, how complex, how important, how attention-catching, it is—contributes to how arousing it is. Core affect is also influenced by one's background environment such as very many minor factors in the physical (weather, odors, noise, aesthetic quality) and social (who is nearby, the type of situation) environment, all impinging at the same time (Russell & Snodgrass, 1987).

### *Complexity of Causal Processes*

The simplicity of "the bear" hides the complex sensory, perceptual, and cognitive processes involved, even when a single stimulus overwhelms core affect. Information from the world is taken in and processed in relation to expectations, knowledge, goals, standards, and attitudes. Each stimulus primes memories and associations. An event is experienced in the context of a set of alternatives that might have been (Kahneman & Miller, 1986). Progress toward a goal is pleasant, frustration unpleasant (Carver & Scheier, 1990, gave a more precise formulation to this idea). Attending to core affect intensifies it (Scheier & Carver, 1977).

In his self-discrepancy theory, Higgins (1987, 1997) described how matches and mismatches between events and what he calls *self-guides* produce changes in "emotion." Higgins's "emotion" fits comfortably with the present analysis of core affect. Matches produce pleasant, mismatches unpleasant, core affect. Matches to an *Ideal* self-guide produce excitement, mismatches sadness. Matches to an *Ought* self-guide produce comfort, mismatches agitation. Thus, the Ideal system works on the diagonal of Figure 1 from lower left to upper right, whereas the Ought system works on an orthogonal diagonal, that from upper left to lower right.

### *Unconscious Causes*

Some of the noncognitive influences already mentioned are in principle beyond one's ability to know about, such as aspects of the background environment (e.g., pheromones, the level of ionization in the atmosphere). Even for cognitively processed information, much of the processing is beyond the reach of consciousness. How core affect responds to the flow of unconscious information is a topic of active research (Niedenthal & Kitayama, 1994). For example, a tachistoscopic presentation of affectively valenced stimuli (smiling faces, positively evaluated symbols) influences subsequent cognitive processing of supraliminally presented material and, cumulatively and eventually, influences self-reported mood (Chartrand & Bargh, 1999; Zajonc, 2000). Little is known about information processing of background information,

but presumably much of it occurs outside awareness. Dimberg, Thunberg, and Elmehed (2000; see also Whalen et al., 1998) showed that backwardly masked 30-ms presentations of happy and angry faces (of which participants were not conscious) reliably produced facial activity indicative of pleasure and displeasure. Valence also depends on success or failure even at goals nonconsciously primed (Bargh & Chartrand, 1999). Öhman and Soares (1994) found that individuals with snake phobia showed a skin conductance response and reported feeling unpleasant arousal to snake stimuli masked so that no conscious recognition of the snake occurred. Öhman, Flykt, and Lundqvist (2000) described this response as "part" of the fear response (p. 313), which is consistent with the idea that core affect is a part of emotional episodes. Another influence on core affect of which the person is unaware is a two-step process suggested by Neumann and Strack (2000). The first step is motor mimicry: One tends to reproduce the smiles, yawns, postures, and other motor actions one witnesses (Bavelas, Black, Lemery, & Mullett, 1986). The second step is that feedback from one's own actions then automatically influences core affect.

### *The Virtual Reality Hypothesis*

Core affect responds to the contents of consciousness whether based on reality or fiction. It varies with thoughts, imaginings, daydreams, memories, and anticipations. If one mentally focuses on a loss, then displeasure follows—even if the loss is imagined, fictional, a future possibility, or some other form of virtual reality. Of course, a real loss or offense powerfully fills consciousness, occasionally to an obsessive degree, and imaginary events are usually more easily dismissed from mind. However, films, plays, novels, poems, and music can also powerfully fill consciousness—and plainly alter core affect. Humans find rubber vomit, chocolate feces, and plastic cockroaches unpleasant despite knowledge that none of these is the real thing (Rozin, Haidt, & McCauley, 2000). Much evidence now shows that mental simulation influences core affect (Sanna, 2000). This hypothesis of virtual reality is also consistent with evidence on the power of imagery in human information processing generally (Kosslyn, 1980). Indeed, it is not difficult to create situations in the laboratory in which people confuse mental imagery with reality (Dobson & Markham, 1993; Finke, Johnson, & Shyi, 1988; Markham & Hynes, 1993).

This is one sense in which "emotion" (core affect) can be insensitive to reality. Consider films. People get tense watching a fictional gunfight and feel bad at the hero's death. Are they actually frightened by a fictional gunfight or saddened by the death of a cartoon hero? This is another of those unanswerable questions that involve everyday concepts. The answer depends. It would be no (or only sort of) if *frightened* and *saddened* referred only to prototypical emotional episodes (which include behavior directed at the Object). Behavior is not altered by the film; that is, people do not flee a staged gunfight or throw water at a TV showing a burning building. (A person who did so would be diagnosed as seriously confused about reality.) The answer would be yes if *frightened* and *saddened* referred only to core affect. The gunfight and the hero's death produce the core affect found in fright and sadness but not the full-blown emotional episode. Even in cases of fiction, the change in core affect is real.

If core affect varies with (among other things) the contents of consciousness, and if most (but not all) behavior requires the



perception that the contents are real, then this dissociation might provide a means of isolating behavioral or physiological correlates of core affect per se. In response to events known to be fictional, people shed tears, tense muscles, and get a lump in the throat. Yet there is no evidence of actual instrumental behavior (fight, flight, etc.) stereotypically associated with specific types of emotional episodes. This dissociation suggests that core affect is not sufficient to produce instrumental behavior and that additional mechanisms are therefore required. Muscle tension and autonomic nervous system changes may, however, be direct consequences of core affect.

Why does core affect respond to virtual reality? Responding to imaginary events is useful. The future and alternatives to reality can only be imagined. By imagining the future, one brings an ancient mechanism (core affect) to bear on organizing future behavior. By imagining alternative courses of future action, one anticipates how one will likely feel about the outcome. By imagining alternatives to past actions, one learns how to avoid making the same mistake again. **By imagining the situations of others and having one's own core affect change accordingly (empathy), one can understand, anticipate, and in a sense share in a companion's feelings.** This line of reasoning hints at why core affect is not tied to specific instrumental actions.

### *Consequences: Cognition and Behavior*

Core affect is a biological product of evolution and therefore likely has a function, which is to be found among its consequences. Some of these consequences, such as taking up working memory, are likely side effects rather than functions, but others are revealing. Here I briefly consider the consequences of core affect in free-floating form. My aim is to illustrate the existence of consequences rather than to discuss conflicting interpretations of results in a rapidly advancing area.

In proportion to its intensity and rapidity of change, core affect evokes attributions, either automatically or deliberately. In doing so, the person searches for material corresponding in affective quality. **As a direct consequence, core affect is implicated in attention, perception, thinking, judgment, mental simulation, and retrieval from memory** (e.g., Baron, 1987; Blaney, 1986; Bower, 1992; Eich, 1995; Forgas, 1995; Forgas, Bower, & Krantz, 1984; Izard, Wehmer, Livsey, & Jennings, 1965; Mayer, Gaschke, Braverman, & Evans, 1992; Schiffenbauer, 1974). The general principle is mood congruency. Pleasant core affect facilitates attention to and the accessibility of positive material; unpleasant core affect facilitates attention to and the accessibility of negative material. The more pleasant core affect is, the more positive are evaluative judgments—provided that the core affect is not attributed elsewhere (Schwarz & Clore, 1983). The more pleasant core affect is, the more optimistic one's simulation of the future (Sanna, 1998). There is some evidence for a corresponding effect for degree of arousal: High arousal facilitates the accessibility of high-arousal material, and low arousal the accessibility of low-arousal material (Clark, Milberg, & Ross, 1983), although Bower and Forgas (2000) offered a dissenting opinion. **In all, if core affect represents the affective quality of one's current context, then memories for contexts similar in affective quality are more accessible** (Eich, 1995).

**Core affect influences the quality and type of cognitive processing.** Much evidence shows that activation influences cognitive performance in a curvilinear manner: Optimal performance occurs at intermediate levels of activation, with the level higher for simpler tasks, lower for more complex tasks (Humphreys & Revelle, 1984). **Increased arousal leads to attention selectivity** (Easterbrook, 1959; Eysenck, 1982). **Negative core affect generally leads to more detailed and critical thinking, whereas positive core affect leads to more heuristic and divergent thinking** (Park & Banaji, 2000; Schwarz & Bless, 1991). There are exceptions, however (Aspinwall, 1998; Isen, 1993). For example, Bodenhausen, Sheppard, and Kramer (1994) found that one negatively valenced state, anger, led to more rather than less heuristic processing (specifically, reliance on stereotypes and source credibility). Their evidence may point to the influence of specific categories of emotion rather than just the dimensions captured by core affect, although, alternatively, Bodenhausen et al.'s angered subjects might have been simultaneously higher in activation than their sad or neutral counterparts and, further, anger includes a set of cognitions that prime other cognitions. (See also Lerner & Keltner, 2000; Niedenthal, Halberstadt, & Setterlund, 1997.)

**As an assessment of one's current state, objectless core affect also has behavioral consequences.** Again, the first principle is congruency. The effects just reviewed on perception, cognition, and memory may go on to influence decisions. One might decide to purchase a product that one evaluates highly because one's pleasant core affect led one to attend to that product's positive features. Bower and Forgas (2000) summarized the evidence: "Temporarily happy or sad people tend to selectively expose themselves to scenes, music, films, and activities in a mood-congruent manner" (p. 185). Even the startle reflex is influenced by core affect in a mood-congruent manner (Lang, 1995). Core affect is part of action preparation and behavioral choice. **Core affect does not dictate one's decisions but assesses one's resources when planning or deciding on actions, and in this way, the effects can be more complex than simple congruency.** Feeling enthused (core affect of pleasure and arousal) gives a person a sense of optimism in choosing goals and plans. One might therefore choose the more difficult task and might work harder at what goal is chosen. Feeling depressed (core affect of displeasure and low arousal) has the opposite effect, and one might therefore choose the less challenging task and work less hard at it. The dimension of arousal assesses one's state of readiness for action or energy expenditure at one extreme versus need for sleep or rest at the other. Arousal is also presumably taken into account in planning, but evidence for this is scarce.

There is also a complicating factor. Persons seek to alter their own core affect (affect regulation) through exercise, diet, and drugs; through choice of place, companions, and activities; and through recreation and entertainment. **People typically seek pleasure and seek to perpetuate it when it occurs. They naturally avoid displeasure and seek to end it when it occurs.** I do not claim that affect regulation is the only motive or that most behavior is to be accounted for by this mechanism. Other motives exist and can combine with or override affect regulation (Parrott, 1993).

It is also possible to go beyond the simple hedonic principle just stated. Persons seek not just pleasure but a specific region of Figure 1. Anxious individuals (core affect of unpleasant high arousal) seek serenity specifically (pleasant low arousal). Bored



individuals can seek excitement. Low-arousal individuals can seek high arousal, and vice versa. Again, the specific drug consumed or activity chosen can follow: Those fatigued drink coffee to perk up; those stressed seek a quiet place to calm down. More generally, tasks and activities vary in their energy requirements, and a person can seek the needed level of arousal.

### Affective Quality

Niedenthal, Halbertstadt, and Innes-Ker (1999) recently provided a series of experiments demonstrating that stimuli are categorized not only according to physical features but also according to one's "emotional response" to them. Mehrabian and Russell (1974) offered evidence that all stimuli, including large-scale environments, are perceived in terms of their affective qualities. Long ago, Osgood's (1969) work with the semantic differential found that affective quality is pervasive in the meaning of words. Such evidence indicates that persons routinely perceive the affective qualities of stimuli.

How best to describe affective qualities remains uncertain. Much research on this topic focuses on a single dimension of evaluation. Osgood's (1969) results suggested three dimensions: evaluation, activity, and potency. Niedenthal et al. (1999) suggested instead discrete emotion categories. I have used a two-dimensional structure that parallels that for core affect (Russell & Pratt, 1980; Russell, Ward, & Pratt, 1981).

There is growing evidence that an initial perception of affective quality (at least on the valence–evaluation dimension) of a stimulus takes place automatically within 25 ms of encountering the stimulus (Bargh, 1997; Bargh, Chaiken, Gollwitzer, & Pratto, 1992; Bargh, Chaiken, Raymond, & Hymes, 1996; Fazio, Sanbonmatsu, Powell, & Kardes, 1986). There is also interesting evidence that automaticity may be limited to the single dimension of evaluation. Bargh, Raymond, and Chaiken (cited in Bargh, 1997) used an automatic priming paradigm. Evaluation, but not activity or potency, was automatically primed.

#### *Perception of Affective Quality Distinguished From Other Processes*

Perception of affective quality can be independent of at least some general knowledge. Perception of affective quality is not the same as conscious rational judgment; one can find the spider unpleasant even when knowing it is harmless. Perception of affective quality must also be distinguished from appraisal. *Appraisal*, in Lazarus's (1991) account, is a weighing of the implications of an event for one's well-being; perception of affective quality is much simpler. For example, you might appraise a medicine as best for your health; nevertheless, your perception of its affective quality is that the stuff smells and tastes unpleasant.

It is especially important to distinguish perception of affective quality from core affect, even though the two are empirically and conceptually related. Tesser and Martin (1996) and Schwarz and Clore (1983) made a similar distinction using the terms *evaluation* and *mood*, respectively. Of course, in many cases, perception of affective quality is accompanied by changes in core affect. Seeing a lovely garden or hearing joyous music usually increases pleasure. Still, core affect need not change to know that the garden is lovely, the Bach tune joyous, or the wild bear scary. Indeed, on occasion,

it is necessary to keep the two separate: While still upset from her encounter with the bear, Alice anticipates that a hug from her husband will be comforting. Whatever one's current core affect, it remains important to estimate the affective quality of various options accurately. Perception of an affective quality per se is a cold perceptual process that fixes a belief about the affective consequences of something without having to undergo those consequences. It is the anticipation of, rather than the experience of, a change in core affect.

Various considerations support this distinction. Whereas core affect is not Object directed, perception of affective quality is. Phenomenologically, core affect is a feeling inside oneself, whereas an affective quality is a property of the thing perceived. It is the garden that is lovely, the stench that is offensive, and the tune that is joyous. People are not aware of making any judgment: They have to be reminded that beauty is in the eye of the beholder.

Second, the examples in which core affect and perception of affective quality are positively correlated are those in which one has the Object perceived (e.g., one enjoys the pleasant meal one is eating). Cases of loss, longing, desire, and, more generally, not having, show the opposite relation. The more pleasant the Object, the more displeasure one feels at not having it. (The more pleasant one judges the meal, the more unhappy one feels deprived of it.)

Third, in principle, perception of affective quality can occur with no change at all in core affect (the depressed patient who acknowledges the pleasantness of the sunset but reports no effect whatsoever on actual core affect). Quickly read the following list of events: gorgeous sunset, car crash, delicious meal, watching someone torture your child. To read the list is to perceive the affective quality of each event, yet I doubt that the reader underwent an emotional roller coaster in the 2 s the reading took.

Fourth, even if you did undergo a change in core affect with each item on the list, the changes were likely smaller in magnitude than the perceived affective qualities of the events themselves. In other words, the slight feelings you had in reading the list cannot approximate the known agony of a car crash or the rage and despair of watching someone torture your child. Even when the two co-occur, core affect and perception of affective quality are quantitatively different processes.

Fifth, core affect and perception of affective quality operate by different rules. The affective quality of a stimulus is relative to other instances of like stimuli, whereas core affect is relative to other instances of core affect. Indeed, one function of core affect is to provide a common metric for comparisons across qualitatively different events. The same issue appears in attempts to assess core affect and a judgment of affective quality. The latter is necessarily focused on a single event, which irresistibly evokes a standard of comparison limited to like events (Helson, 1964; Parducci, 1995). A particular loaf of bread might be judged excellent, at the top of the rating scale, because it compares favorably with all other loaves. Yet, for most readers, core affect might move but little on receipt of the bread.

Sixth, I hypothesize that a human being has but one core affect at a time: A pleasant mood is incompatible with an unpleasant mood, high arousal incompatible with low. In contrast, people simultaneously perceive the affective qualities of many different stimuli: The boring friend, the relaxing garden, and the stimulating tune are simultaneously present, all with different affective qualities. Even the same object can have different affective qualities

because it has different properties and aspects. Events unfold over time, and different stages can each have a different affective quality.

Psychologists have struggled with a puzzle: There are indications that affective dimensions are bipolar. The words *happy* and *sad* are perceived as opposites; feeling happy and sad are negatively correlated (Russell & Carroll, 1999). There are also indications that people can feel ambivalent or, more generally, have “mixed feelings” about something (Cacioppo & Berntson, 1994; J. T. Larsen, McGraw, & Cacioppo, 2001). Distinguishing core affect from perception of affective quality might help resolve this paradox: The dimensions of core affect and hence of affective quality are bipolar. At the same time, one can perceive many different (including opposite) affective qualities simultaneously. Ambivalence and mixed reactions arise because objects and events have different aspects, properties, or stages. On this hypothesis, ambivalence does not occur as core affect but as a perception of two opposite affective qualities of a complex Object. One may be ambivalent about joining the boring friend to listen to the joyous music. Doing so, nevertheless, creates a single core affect. This hypothesis remains to be tested.

Seventh, if core affect is as important as I believe, then it is not surprising that human beings have the ability to represent (and hence think about and anticipate) core affect. They can represent and think about different events, different actions, and different outcomes—without having to actually experience the events, execute the actions, or suffer the outcomes. Just as they can represent and think about their own memory processes (*meta-memory*; Flavell & Wellman, 1977), they can represent affective qualities without having to undergo actual changes in core affect. Separation of perceived affective quality from core affect is needed for decision making.

Eighth, empirical evidence supports the distinction. In certain circumstances, presentation of stimuli with different affective qualities (e.g., happy and sad colors) influences subsequent information processing without influencing core affect (Soldat, Sinclair, & Mark, 1997).

### *Substitution Hypothesis*

Although core affect and perception of affective quality are conceptually distinguishable, the two processes are empirically linked, as in mood-congruent priming (Forgas, 1995) and misattribution (Schwarz, 1990). In mood-congruent priming, core affect makes available like-valenced information; feeling happy, the person processes more positive information about the Object and hence overestimates its pleasantness. In misattribution, core affect due to one source is misattributed to the target; feeling happy, the person attributes the happy feelings to the Object and therefore perceives the Object to be more pleasant than it would otherwise seem.

Misattribution arises because core affect naturally plays a role in learning of the affective quality of a novel event. On encountering an unfamiliar neutral object, one learns of its affective quality by interacting with it. You discover that an acquaintance is fun by having fun with him (Bem, 1972; Fazio, 1987). He is coded as fun in memory and therefore in anticipation. Of course, the nature–nurture question arises. This estimate can, but need not, rely on one’s experienced change in core affect. The pleasantness of sweet

tastes, of savannah-like landscapes, of healthy symmetric faces suggest an environment precoded on affective quality. Even with an object previously coded, people are unlikely to be certain of its affective quality; they update and revise their estimates. More formally, the hypothesis is that current core affect is used as information in perception of affective quality in proportion to the uncertainty associated with that perception (Schwarz & Clore, 1983).

The complication is that people have no sure knowledge about how much their current core affect is influenced by a given target object. The person is therefore forced to rely on current core affect with no means to assess the target’s exact contribution to that feeling. Perception of affective quality of an Object can be influenced by changes in core affect arising from the Object or arising independently of that Object. Thus, the process is one of inference that can be led astray. For example, subjects told that the laboratory setting would likely inhibit feelings of mirth found humorous monologues funnier than did control subjects (Olson & Roese, 1995). Although core affect is an old and simple system, and perception of affective quality a fallible system, both likely work well in the nonexperimental world.

## Attributed Affect

### *Object*

Often the Object seems to be an objective event, such as the bear. Nonetheless, the Object must be described in psychological rather than objective terms, for the Object can be something remembered, imagined, dreamed, fictional, counterfactual, or hallucinated. The Object is a psychologically constructed event, absence of an event (deprivation, loss, frustration), or prospect of a future event (hope and fear). It can be oneself or one’s own properties or actions. LeVine (1963) found among the Gusii of Kenya that encounters with witchcraft and sorcery provided the most intense emotions. The Object is whatever the person believes is making him or her feel current core affect, even if an objective analysis says otherwise.

One can be mistaken about the Object’s properties or even existence. Watching the film *The Lion King*, one can feel bad that Mufasa is dead. But the objective facts might be otherwise; perhaps Mufasa only appears to be dead, or he might not be dead yet, or as a fictional character he was never alive in the first place. Interestingly, the Object does not even have to be believed; you can know that Mufasa is a cartoon character and still feel bad about his death.

Ordinarily, the Object comes unbidden, but not always. In affect regulation, one can seek out, either physically or mentally, an Object of known affective quality in order to create the core affect (Hochschild, 1983; R. C. Solomon, 1976). If for some reason you want to feel sad (perhaps you are a method actor or are participating in a psychology experiment, or perhaps you believe that you should feel sad at the death of a disliked relative), then you can imagine or remember events that lead you to experience sadness. You can also try to focus on those aspects of the Object before you that are sad. Just as, in more usual circumstances, you can try to ignore them.

### *Attribution*

In many cases, such as joy in triumph or distress at seeing the bear, the change in core affect is so dramatic and the cause of that change so obvious that the machinery of attribution is overlooked. The phenomenal experience of most attributed affects fails to recognize any attribution process; instead, one subjectively experiences a simple affective reaction to the Object. However, there is now good empirical evidence to suggest that attribution is involved (London & Nisbett, 1974; Nisbett & Schachter, 1966; Ross, Rodin, & Zimbardo, 1969; Weiner, 1985).

However subjectively confident a person may be, the attribution process is fallible. Much evidence now suggests that people can be wrong about the causes of their activities in general (Karniol & Ross, 1996; Nisbett & Wilson, 1977). Because core affect is multiply determined, it is particularly easy to overestimate the magnitude of a focal Object's impact on core affect. Core affect can therefore be misattributed relatively easily (Keltner, Locke, & Audrain, 1993; Ottati & Isbell, 1996; Schwarz, 1990; Schwarz & Clore, 1983; Schwarz, Strack, Kommer, & Wagner, 1987). How often and in what circumstances misattributions occur outside the laboratory remains to be examined.

When both the core affect and the Object are salient (Taylor & Fiske, 1975), the attribution process is quick, simple, and automatic. The temporal contiguity of two salient events (sudden upset and the bear) suffices to produce the attribution. (This kind of attribution requires no theory of how one produces the other—just as one can know that pushing a button causes the motor to start without understanding how.) Although attribution was once described in a way that seemed slow and deliberate, it has been found to be spontaneous (Winter & Uleman, 1984) and automatic (Gilbert, 1989), especially for negative core affect (Bohner, Bless, Schwarz, & Strack, 1988).

In other cases, either the core affect or the Object might be focal, and the other must be sought. When core affect is salient but no Object is, the attribution process can be slower and involve more complex and deliberate inferences. The attribution can therefore follow the change in core affect by a fair amount of time. Morgan and Averill (1992) gave this example from an interview:

One day I just began to cry and couldn't stop. It lasted for about ten hours. When I stopped I just sat there and tried to figure out what was bothering me. I really had no clue as to why I was crying. (p. 101)

There is little evidence on which to base hypotheses about just when core affect evokes a search for an Object. (The alternative is to experience a simple mood.) Perhaps the larger, more rapid, and more salient the change in core affect, the more likely it is to evoke an attribution process. Alternatively, people might spontaneously seek Objects for any change from neutrality. Indirect evidence for this natural tendency to seek causes can be seen in the "causal belonging" hypothesis: Mood-dependent memory is enhanced when the to-be-remembered material is causally linked to the mood (see review by Bower & Forgas, 2000).

When an Object is deliberately sought, attribution depends upon the usual cues (such as contiguity), but it also depends upon the currently coded affective quality of each available possibility. Feeling upset (unpleasant arousal), one searches for something upsetting. The process is likely one of mutual adjustment: By the substitution hypothesis, perception of affective quality of an object

is based on the change in core affect. If you hear a tune and feel joy, then you perceive the tune as enjoyable. At the same time, you attribute your joy to the tune. The search for an Object may also be constrained in other ways. Displeasure associated with nausea may lead to a search for novel foods as the cause. Displeasure associated with pain sensations lead to a search of the part of the body in pain.

The second possibility is that the Object is focal but its contribution to core affect unclear. A perfectly correct apportioning of current core affect to different causes is difficult. For instance, in what has been called *displacement*, a person angry at one Object allegedly becomes angry at another safer Object. Alternatively, the person may simply have difficulty deciding how much current distress is due to the first, how much to the second. Focusing attention on the second object, the full distress may be attributed there. Focusing attention back on the original Object, less distress may be attributed to the second (Schwarz & Clore, 1983).

### *Consequences*

Attributing core affect to an Object is the first step in solving the problem quantified by core affect. Although direct evidence is scarce, this perspective suggests that attributed affect thus guides current behavior to the Object and provides information for future interactions with that Object.

### *Guiding Current Behavior*

The degree of influence of attributed affect on current behavior forms a continuum. At one extreme, minimal change in behavior occurs: Core affect is preparation for action, but not action. One can simply be prepared but not act. This statement is obvious for Objects in the distant past or far future. Memories about a death years ago can produce strong core affect without triggering instrumental action. Similarly, anticipation of future difficulties can produce strong core affect even if one nevertheless decides to bear the risk in the hope of gain. A greater degree of influence occurs when the current plan is maintained but adjusted. For example, a conversation is prolonged or shortened if the associate is perceived as a cause of pleasure or displeasure. At the other extreme, a new plan and goal are adopted altogether.

### *Information*

To attribute core affect to an Object is to discover the affective quality of that Object. Encountering something for the first time (a novel food or a new type of music), you can notice how your core affect changes as you interact with it. In addition, attributing core affect to an Object focuses attention on the Object and you search the environment for information about it. When one has an attributed affect, a memory of the core affect is integrated with the schema for that event (the Object) in memory. Sometimes the Object's main feature is its affective quality: That was a fun restaurant. Such memories are a mechanism of reward and reinforcement because the likelihood of going to the restaurant again is altered. When a person comes to make a decision, goals are often defined in part in affective terms (the search for a relaxing piece of music, a fun pub, an interesting book), and plans are

formulated according to the remembered affective quality of persons, places, and things.

This process can be used deliberately, because attributed affect occurs to fictional as well as factual Objects (the virtual reality hypothesis). Encountering the future in your imagination allows you to anticipate how you will feel about it. Kahneman and Tversky (1982) proposed a simulation heuristic whereby certain judgments are based on imagined alternative courses of events. Encountering an unfortunate turn of events, people imagine a more pleasant alternative. (Missing an airplane by 5 min, you imagine a counterfactual course of events that would have got you to the plane on time. The ease of its construction is proportional to the amount of regret you experience. Regret here is an unpleasant core affect attributed to missing the plane.) Such simulations are an obvious means of learning how to correct mistakes. Simulating the future allows anticipation of various features, including one's core affect in reaction to the imagined scenario: If such and such happens, then I will feel satisfied. These judgments are probably not perfect predictions of actual feelings, but they are far from random.

Because an imagined event can be the Object of an attributed affect, attributed affect allows anticipation of how core affect will change in reaction to an unknown event, especially an elaborate scenario. In this way, the task of anticipating the future is shared by attributed affect and stored knowledge of affective quality. The difference is that the memory of affective quality typically comes quickly and automatically as precoded values of events or their features. Simulation is slower, more deliberate, more time-consuming, and costly. Imagine you are invited to a party at a colleague's home. If you've been to his parties before, you likely have a memory of such a party's affective quality. Otherwise, you must pause to imagine what it might be like: who might be there, what might happen. To this particular full scene created in your mind, you can allow your core affect to respond. If you feel good as your imagination runs, you go. If you feel bored or tense, you stay home. Simulating the future provides an affective forecast.

### Emotional Episode

Emotional episodes are defined in terms of categories, because people divide the world into categories. Very broad mental categories (objects, people, events) are subdivided into narrower ones: objects are subdivided into tables, chairs, and so on; people into young and old, men and women, and so on; events into meals, emotions, and so on. These, in turn, can be further subdivided (emotions into fear, anger, and so on). Some categories are widely shared, others unique to a group or even an individual. An indefinite number of such categories can be formed. For each category, people (including scientists) possess a prototype—structured as a script in the case of emotion (Fehr & Russell, 1984; Fischer, 1991; Lakoff, 1987; Russell, 1991; Russell & Fehr, 1994). (An emotion concept could also be characterized as a cognitive model, a folk model, or a schematic plot; for present purposes, differences among these accounts can be set aside.)

A prototypical emotional episode is an actual occurrent event that fits the prototype for a given category of emotion, such as that labeled *fear*, very well. An emotional episode is an actual occurrent event that comes close enough to count as an instance of the category even if not an exemplary one. Put differently, the proto-

type (mental model) of fear exists in the mind of an observer (as the intension of the mental category); a prototypical emotional episode of fear exists (whether observed or not) in the external world (as the extension of the mental category). In the prototype, the ingredients have a simple temporal order and causal connections. In actual emotional episodes, each ingredient is an ongoing process, and these ingredients need not occur in the order given.

### *Components of an Emotional Episode*

#### *Core Affect*

A prototypical emotional episode includes a large change in core affect. One cannot be prototypically afraid without feeling great displeasure and activation. Fear does not have a single fixed value in the space of Figure 1. In any actual case, core affect fluctuates over the course of the episode as a threat arises and then as one nears success or failure. In some cases, core affect moves to extreme distress only when coping with the danger breaks down. Further, cases of fear exist without the displeasure–high arousal, as in high arousal but not unpleasantness of extreme sports or in the calm response to danger that might be described as *sangfroid*.

Studies of self-reported emotions—as anticipated from stories (Russell & Mehrabian, 1977), as remembered from the recent or remote past (Feldman Barrett & Russell, 2000), or as currently experienced (Watson & Clark, 1992)—consistently found large general factors, here interpreted as pleasure and arousal, common to reported discrete emotions and accounting for a good portion of the valid variance. Complementary evidence comes from studies in which sedative and stimulant drugs were used to manipulate arousal and were found to influence self-reported discrete emotions (Cooper, Zanna, & Tabes, 1978; Gerdes, 1979; Schachter & Latane, 1964; Schachter & Wheeler, 1962). A prediction is that parallel studies using drugs to manipulate pleasure and displeasure would also influence self-reported discrete emotions.

When a person confronts an event, core affect begins to change immediately, perhaps sometimes before the event is consciously registered (Öhman, 1999). For example, Chartrand and Bargh (1999) found that subliminally presented valenced words had a cumulative effect on self-rated core affect. As already described, core affect has also been found to influence the interpretation of events. Putting these two findings together suggests that core affect might already be influencing the interpretation of the event that becomes the Object of the emotional episode, even before that Object is consciously perceived. This hypothesis has not been tested directly.

#### *Perceptual–Cognitive Processing of the Antecedent: Constructing the Object*

In common sense, the emotion is simply elicited (*triggered* is the favored metaphor) by the antecedent event. Triggering is here replaced with an attributional process in which the Object can be sought and analyzed. I do not believe this is merely pedantic complexification, for the construction of the Object is central to the nature of a prototypical emotional episode. It matters whether one is pleased by the gift or the giver or whether one is angry at the boss, at authority in general, or at one's own lack of effort (Weiner, 1985). In a prototypical emotional episode, antecedent and Object



largely coincide, but studies of misattribution suggest they need not.

*Perception of affective quality.* As with most things encountered, the antecedent is perceived as to its affective quality. This estimate can change as core affect changes and is attributed to the Object, but an initial estimate of affective quality helps in selecting among candidates for Object. This “evaluative” step is included in appraisal theories of emotion, often as the first dimension (Arnold, 1960; Smith & Ellsworth, 1985).

*Attribution.* Prototypical emotional episodes are those rare cases in which core affect is overwhelmed by a single event. With prototypical antecedents, such as Alice’s bear, the cause of the change is obvious; there is little chance of being mistaken and the attribution process likely automatic. Nevertheless, evidence already reviewed has shown the importance of an attributional process and the possibility of misattribution. The present approach thus follows in the footsteps of those theorists who have analyzed emotions as growing out of simpler ingredients through a process of attribution (Bem, 1972; Blascovich, 1990; Higgins, 1987; Keltner et al., 1993; Öhman, 1999; Olson, 1990; Schachter, 1964; Weiner, 1985). The most direct evidence to date on attribution’s causal role in emotional episodes comes from a novel technique developed by Neumann (2000). An initial priming task was used to create a tendency to make internal versus external attributions, which, in turn, was found to influence whether guilt or anger was experienced in response to an ambiguous situation.

*Appraisal.* There is now considerable evidence that prototypical emotional episodes typically involve appraisals beyond simple pleasantness and arousing quality (Roseman, 1991). Appraisal is sometimes thought of as a cognitive computation that occurs after the antecedent and before the emotion. The present analysis is different. Here “emotion” is not an event, and the perceptual–cognitive processing of the Object is ongoing. Not every antecedent event is totally novel, requiring a new appraisal on the spot. Many persons, events, or other Objects are already known and their arrival anticipated. Encountering a well-known enemy or being told that a dying relative has taken a turn for the worse simply reinstates a previously calculated appraisal (Clore & Ortony, 2000). Furthermore, consistent with Zajonc’s (1980) suggestion, the information processing that influences core affect may be one thing, what influences attribution another, and what influences emotional behavior yet another. For the simplest example, core affect is influenced by a fictional Object, yet fight or flight behavior requires a perception that the Object is real. More precise statements on this topic, however, await more evidence.

### *Instrumental Action*

Everyone knows that fear brings flight and anger brings fight. Still, this commonsense analysis is not without problems. One is defining terms like *fear* and *flight* and another is stating the exact relation between the behavior and the emotion. There is no agreed-on account of how emotion relates to instrumental behavior (Carver & Scheier, 1990; Mandler, 1984; Ortony et al., 1988). Does fear cause flight (as common sense has it), or vice versa (Bem, 1972; James, 1884)? In other accounts, behavior is the emotion (*logical behaviorism*), or behavior (or a behavioral tendency) is part of the emotion. Many writers have simply been inconsistent or unclear on this point. If fear is defined as flight,

then no empirical claim is being made. If fear includes flight as one of its components, then the fear per se cannot explain the flight. Rather, the behavior is explained, at least in a causal sense, by the Object–antecedent.

Another problem is specifying instrumental behavior for each emotion. Such prototypical emotions as happiness and sadness seem to lack any specific instrumental action. Others, such as fear, clearly do not always lead to the same action—hence a weak correlation between flight and (the other components of) fear. If flight is one of the pieces of raw data contributing to the perception of fear, then a positive correlation can be expected, and, of course, people do sometimes flee what they fear. Nonetheless, consider cases of flight without fear and fear without flight. One moves away from objects that are not frightening: The object might be disgusting, boring, hateful, embarrassing, or shameful; the object might be a reminder of sad memories; or one might flee temptation. Now consider cases that would consensually be labeled fear but that do not include flight. Earlier, I mentioned anecdotal observations of different fears with different actions. Some people seek out the most frightening roller coasters and movies, when they are not hang gliding or bungee jumping. Of course, flight could be defined so broadly as to include all these behaviors, but then few if any specific actions would be excluded and *flight* would be a metaphor for any action aimed at solving the problem presented by the Object. The question remains of how to account for or predict the specific action taken on a specific occasion.

These anecdotal observations are supported by much human data on the dissociation of fear from its hypothesized flight behavior; more on dissociations shortly. Of course, data from countless laboratory experiments could be cited in which fear and flight are associated. However, in laboratory situations, an animal is sometimes given no solution to the problem posed by the Object other than flight or avoidance. In situations with more options available, animals show a range of behaviors to fearful stimuli, including what must be considered a type of approach, namely, exploration (MacDonald & Pinel, 1991; Pinel & Mana, 1989). In the wild, animals sometimes react to frightening stimuli with defensive aggression, such as an entire flock mobbing a predator (Lorenz, 1966).

In the present account, behavior does not divide naturally into two qualitatively different classes, the emotional and nonemotional. Instead, behavior during an emotional episode is accounted for in the same manner as all behavior. The psychology of behavior is beyond the scope of this article, but I can sketch my alternative to the traditional account in broad outline. In doing so, I take no stand on the relative contribution of genetic and epigenetic influences on behavior.

Core affect already includes a general mobilization in Figure 1’s vertical axis of activation (Cannon, 1927), akin to Frijda’s (1986) action readiness or Bradley and Lang’s (2000) disposition to action. Here, mobilization is not specific as to type of emotion or action. (Not all emotions involve heightened arousal; some, such as sadness and depression, are associated with low arousal.) Heightened arousal contributes to the vigor, speed, and intensity with which any specific action plan is pursued (Duffy, 1941; Hebb, 1955). It may also use attentional capacity and working memory so that decision making is focused but simplified.

The valence dimension of core affect is also linked to action. Once it is attributed to an Object, pleasure–displeasure of core

affect becomes one's assessment of the Object and therefore a weighing of, for example, the costs threatened or suffered. There is a general hedonic goal to end displeasure and to seek pleasure. Extremity of valence might thus contribute to the vigor and intensity of action. There are also empirical and conceptual reasons to link pleasure–displeasure to a broad behavioral dimension of approach versus withdrawal (Davidson, 1992a). However, the specific instrumental action taken depends on the specific Object. On some occasions, pleasant core affect is associated with satiety and therefore cessation of action, and negative core affect can be associated with approach, as when a distressed toddler seeks its caregiver (Bowlby, 1969).

Still, core affect, being general, can provide only a general guide to behavior. The action taken on any given occasion must be specific. Presumably, reflexes, conditioned reactions, habits, schemas, scripts, and other automated action sequences—inherited or acquired—can be recruited. Core affect has a role here as well, as in startle reflex potentiation by unpleasant core affect (Lang, 1995), but what triggers an automated sequence is the specific antecedent–Object or its surrounding context. Bargh and Chartrand (1999) pointed to ways in which the immediate environment automatically controls aspects of behavior as shown in studies of mimicry, behavioral coordination, and movement synchrony. For example, perceiving the bodily movements and postures of another person automatically produces similar movements and postures.

An evolutionary perspective has been taken to emphasize the advantages of prepackaged instrumental responses to recurring situations. Of course, prepared responses exist and are recruited into action sequences, but it is doubtful that a large-scale action sequence such as Alice fleeing the bear could be prepackaged. To be effective, it would have to be worked out on the spot to fit the current situation. Prototypical emotional episodes often involve interruptions by unexpected events or thwarting of normally successful automated responses (Mandler, 1984). In such cases, a person may not have an automated response. (Indeed, I suspect that not knowing what to do is a major source of the agitation of emotional episodes.) In such cases, action must be planned and directed at a goal. That emotions often involve goals is now argued by a number of theorists (Bandura, 1991; Carver & Scheier, 1990; Cosmides & Tooby, 1995; Emmons & Diener, 1986; Frijda, 1986; Higgins, 1987; Mandler, 1984; Ortony et al., 1988; Power & Dalgleish, 1997).

Miller, Galanter, and Pribram (1960) assumed that an act is directed at a goal, guided by a plan, and consists of a series of sub-acts. Each sub-act, in turn, can similarly be thought of as directed at a goal, guided by a plan, and consisting of a series of sub-sub-acts. This decomposition can be carried down to the level of muscle contractions enduring but milliseconds. Some act sequences are inherited, some prepared, some automated, and some constructed on line. Going in the other direction, Miller et al. saw each act as part of a larger sequence of acts leading to some larger goal. Therefore, any individual action is generally embedded in a series of goals (I stand in order to walk to the door in order to leave the house in order to travel to the airport in order to . . .).

Of course, behavioral reality is messier than the picture just painted. Actual behavior is carefully attuned to the actual circumstances of its occurrence, and the plan must therefore be thought of not as a fixed action sequence but as a strategy that responds to current information. Behavioral planning is a complex cognitive

process, aimed at reducing costs or enhancing benefits, as quantified by valence. It also includes what Lazarus (1982) called *secondary appraisal*, which is taking stock of one's own resources in coping with the Object. Hastily selected goals are not always realistic, plans not always effective or well designed. A person can have conflicting goals, and of course, new circumstances arise, resources may not be available, expectations may not be fulfilled. Accomplishment of an act does not necessarily lead to the anticipated goal. Obviously, such planning is not the slow, careful, deliberate process typically associated with the word *plan*. In a prototypical emotional episode, people can plan impulsively, poorly, unrealistically, or thoughtlessly. Further, the goal itself need not be deliberately selected but may be automatically activated by the antecedent–Object or its context. Goals and plans can operate unconsciously (Bargh & Chartrand, 1999), and when they do, it is core affect plus the antecedent–Object or other aspects of the situation (rather than a discrete emotion) that activates the goal and plan.

Many prototypical emotional episodes are responses to emergencies. Quickly, whether automatically or deliberately, a goal is selected. A behavioral sequence is hastily planned (not necessarily consciously) to suit the Object, circumstances, one's resources, and other goals. In some circumstances, the best one can do is a panicky flight from danger, but if other options are available, those options are pursued as vigorously as flight. (Facing the bear, Alice might try to hide, seek safety, destroy the bear, or obtain help, depending on a very quick assessment of her options.) The plan depends on what one is afraid of. There is no all-purpose plan that suits even wild bears, let alone ill health, financial ruin, public speaking, and missing an airplane.

To account for fight, flight, and so on in the same way that one accounts for calm, everyday behavior violates common sense. For example, unlike everyday behavior, emotional behavior is experienced as beyond deliberate control. Wegner and Wheatley (1999) analyzed the experience of deliberate control as requiring three conditions: (a) The thought of doing the action must precede the action, (b) such thoughts must routinely precede such actions, and (c) no other obvious cause of the action is present. The circumstances of a prototypical emotional episode work against all three conditions: Against (a) is the speed with which actions are planned and executed, against (b) is the novelty of the situation, and against (c) is the presence of the Object forcing the behavior. In Wegner and Wheatley's analysis, all behavior is produced in the same manner (by similar brain structures), but some happen to fit a pattern interpreted as deliberate control. If so, emotional behavior is of a kind with all other behavior, not a qualitatively separate class.

### *Peripheral Physiological Activity and Expressive Signs*

In constructing a behavioral sequence, a variety of mechanisms are recruited, some inherited and some acquired. The lowest levels of Miller et al.'s (1960) hierarchy consist of prepackaged sequences (e.g., coordinating leg movements in order to run). This brings up a question: Might not fear, anger, and other basic emotions bring with them (or include) automated sequences at some level of the hierarchy, even if goals and plans are needed at a higher level? Might not fear, for example, involve a specific physiological pattern in the autonomic nervous system and a

specific expressive signal on the face? This is a plausible theory, and many have endorsed it; if found, such patterns and signals would necessitate the postulation of fear as a natural kind. Also, prototypical emotional episodes do include autonomic, facial, and vocal changes. However, available evidence allows an alternative interpretation in which these changes are not emotion specific and can be accounted for in terms of core affect, perception of affective quality, or as parts of instrumental actions.

Cacioppo et al. (2000) reviewed evidence on facial electromyography and concluded that

emotions can be characterized as a coalition of normally loosely coupled control mechanisms that are temporally recruited in a hierarchical sequence in order to meet an environmental challenge (imagined or real). The global distinction between hospitable (positive) or hostile (negative) stimuli, which is among the first information extracted from stimuli (Zajonc, 1980), may be one of the first aspects of an emotional response to be reflected in peripheral physiological activation in the form of rudimentary facial efference. (p. 179)

In present terms, the initial facial response is part of an attributed affect in which core affect responds to and is attributed to an Object perceived to have a corresponding affective quality. A surprisingly large amount of facial movement can be accounted for in this very simple way (Russell, 1997). Beyond those related to pleasure and arousal, other facial movements occur. Evidence on whether such facial patterns signal discrete emotions has been mixed (Camras, 1992; Fernandez-Dols & Ruiz-Belda, 1997; Fridlund, 1994; Frijda & Tcherkassof, 1997; Russell, 1994, 1995, 1997). They can be accounted for in a number of alternative ways, especially as parts of cognitive reactions (attending, looking) and incipient instrumental actions (Frijda & Tcherkassof, 1997), especially social interaction (Fridlund, 1994; Ortony & Turner, 1990; Scherer, 1992; Smith & Scott, 1997). For example, Michel, Camras, and Sullivan (1992) found that brow raising (said by Izard, 1977, to be part of the signal for the basic emotion of interest) occurs mainly within the act of looking. Fridlund (1994) considered a smile as part of friendly, acquiescent, or submissive social acts rather than as a signal of happiness. In support, Fernandez-Dols and Ruiz-Belda (1995) found evidence that even at times of extreme happiness, smiles occur mainly as parts of acts, such as acknowledging other persons, and not otherwise. (For a more detailed analysis along these lines, see Russell, 1997; for a defense of the traditional view, see Ekman, 1994; Izard, 1994.)

A similar analysis applies to activity of the autonomic nervous system. Cacioppo et al. (2000) also reviewed evidence on peripheral autonomic patterns unique to each discrete emotion and concluded the following:

Thus the evidence for the visceral differentiation of emotion, like that for incipient facial differentiation, is clearer when positive and negative emotions are contrasted than when discrete emotions are contrasted . . . . [A] stimulus is depicted as initially undergoing a rudimentary evaluation. Although not sufficient to produce emotion-specific somatovisceral activation, the rudimentary evaluation of the stimulus may at least identify it as one that is to be approached or avoided, producing a cascade of central and peripheral responses. (p. 184)

Evidence of invariant physiological signatures unique to each discrete emotion is weak (Cacioppo et al., 2000; Zajonc & McIn-

tosh, 1992), and what physiological changes occur can be accounted for as general arousal and as preparation for specific behaviors (Gray, 1994; Kirby & Smith, 2000; Lang, Bradley, & Cuthbert, 1990). For example, fear elicited by an escapable stimulus involves heart-rate acceleration, whereas fear elicited by an inescapable stimulus involves heart-rate deceleration (Hamm, Cuthbert, Globisch, & Vaitl, 1997). Of course, if fear is defined as flight and anger as aggression, then it follows that there might well be specific patterns of autonomic activity that prepare for these more specific instrumental actions (although many questions remain), but the relative dissociation of instrumental action from other components of specific emotions raises the question whether autonomic changes co-vary with fear or flight, with anger or aggression. (For a defense of the traditional view, see Levenson, 1994.) The existence of physiological and expressive signatures for specific emotions remains a viable but unconfirmed hypothesis, and new evidence is much needed to test the alternative suggested here.

### *Emotional Meta-Experience*

For some, the most compelling evidence for discrete emotions is the personal experience of those emotions. People feel not just pleasant or unpleasant and aroused to a certain degree but a specific emotion, such as anger, fear, or jealousy. I believe that these specific feelings are real, but I interpret them as emotional meta-experience. Two accounts can be distinguished.

*Nativist view.* According to a nativist account, subjective emotional experiences come biologically divided into discrete categories. Anger, fear, and jealousy are thus like the sensations of red, green, and blue. Magai and McFadden (1995) gave clear voice to this assumption: "The infant experiences anger as a primitive organic sensation" (p. 154). Each discrete kind of emotional experience is assumed to be simple, universal, inherited, and irreducible. One implication is that the concepts of anger, fear, and so on would be necessary in a scientific analysis of subjective emotional experience. Although this traditional view is intuitively appealing, various questions arise: How many discrete kinds of emotional experience exist? Folk theory is profligate in postulating an extremely large but indeterminate number of them. Is it one per emotion word? If so, in which language? What evidence supports the hypothesis of discrete natural kinds? A nativist view was assumed in the theories of Tomkins (1962, 1963) and Izard (1977), but the number of distinct subjective emotional experiences was limited to one for each basic emotion. Wierzbicka (1992, 1999) has mounted an articulate critique of the idea that subjective emotional experience thought of in terms of the English words *anger*, *fear*, and so on is simple, universal, inherited, or irreducible. Psychometric analyses of self-reported experience of emotion have not uncovered an agreed-on set of discrete emotional experiences (Russell & Mehrabian, 1977; Watson & Clark, 1992).

*Constructionist alternative.* An alternative to the nativist account is a mechanism of construction of all instances of emotional meta-experience (James, 1884; Kagan, 1971; Laird & Bresler, 1992; Lewis & Michalson, 1983; Mandler, 1984; Schachter & Singer, 1962). Just as there are no natural kinds of percepts, there are no natural kinds of emotional meta-experiences. Indeed, from this viewpoint, an emotional meta-experience is a perception of oneself. The prefix *meta* draws attention to the notion that the raw

data for this conscious experience are themselves typically consciously accessible experiences: changes in somatosensory sensations, core affect, behavior, cognition, and the appraised qualities of the Object. These raw data are then interpreted and integrated. Farthing (1992) distinguished primary from secondary consciousness, with the latter a form of metacognition. In these terms, the nativist says that the experience of anger or fear is primary consciousness, the constructionist that it is secondary.

As with other forms of perception, the process of constructing meta-experience is more complicated than it appears, and more fallible. Alice does not simply introspect and register the reality of a state of fear, any more than she simply registers the reality of the bear, although it seems that way to her. Rather, in both cases, much information processing intervenes between the registration of the raw data and the final percept. Emotional meta-experience is not necessary for the occurrence of changes in other components—these can all occur before or even without the person having an emotional meta-experience, just as presumably happens in other species and in human toddlers (and perhaps in individuals with alexithymia). To experience fear is to perceive a strong resemblance between one's current state as one knows it and the mental script for fear. Like all perceptions, emotional meta-experience is fallible. One can be jealous (from an external observer's point of view) but sincerely deny feeling jealous. Thus, emotional episodes can be studied without reference to conscious feelings specifically of fear, anger, jealousy, and the like. Emotional meta-experience emerges relatively late in ontogenesis and phylogenesis.

A constructionist account of emotional meta-experience is consistent with recent efforts to understand consciousness in general. Echoing James (1884), theorists, including Gray (1999), Le Douarin (1996), and Öhman (1999), have written of conscious emotional feelings as monitoring and therefore following rather than preceding other component processes. The reasons for such views can be seen in the dramatic findings Gazzaniga (1989) described:

Studies on split-brain patients have revealed the presence of a system in the left hemisphere that interprets these actions, moods, and thought processes that are generated by groups of modules that are acting outside the realm of our conscious awareness. The left-brain "interpreter" constructs theories about these actions and feelings and tries to bring order and unity to our conscious lives. (p. 947)

For example, Gazzaniga produced mood shifts through information given to the right hemisphere of a split-brain patient. The left hemisphere then constructed a fictional but mood-congruent account of that information.

*Concepts and categories.* To have an emotional meta-experience—to perceive oneself as afraid, angry, jealous, or as having some other discrete emotion—is to categorize one's state. Little evidence is available on the conditions under which categorization does or does not occur. When it does occur, it draws on mental categories such as fear, anger and the like. These are not simply mental pigeonholes but are each structured as a script that specifies a temporally ordered and causally linked sequence of subevents (Fehr & Russell, 1984; Russell & Fehr, 1994). Further, the meaning of such concepts depends on their role in a larger system of meaning. Jealousy, for instance, is also a node in a network that includes social conventions, moral rules, role obligations, and so on.

*Learning, culture, and language.* Not everyone uses the same categories. Some categories are more accessible than others, and individuals differ in which are more accessible (Bruner, 1957; Higgins, Rholes, & Jones, 1977). Differences from one language to another suggest, although they do not prove, cultural differences in mental categories for emotion (Russell, 1991). The English language labels hundreds of mental categories for types of emotion. Other languages provide a different number, in one case only seven. And the categories themselves are somewhat different (Russell, 1991; Wierzbicka, 1992, 1999). Lutz's (1988) analysis of the Ifaluk concept of *fago* has provided a clear example of an emotion concept very difficult to render in English.

If emotional meta-experience is an act of categorization, and if the categories vary with language, then emotional meta-experience would correspondingly differ from one culture to another. The implication of this account is that the feeling of *fago* is not a raw irreducible sensation, but a perception of oneself in terms of a mental category expressed by the Ifaluk word *fago* (Lutz, 1988). For the same reasons, the feeling specifically of fear is not a raw irreducible sensation but a perception of oneself in terms of a mental category expressed by the English word *fear*. This hypothesis is analogous to saying that the same object might be perceived as a table, a sacred altar, a valuable antique, something to hide behind, or firewood, depending on the available categories and goals of the observer.

The implication of this perspective is that the same objective state could be categorized as different emotions or as a nonemotion. Thus, Levenson, Ekman, Heider, and Friesen (1992) found that the same pattern of facial and autonomic physiological activity was interpreted as emotional by Americans but as nonemotional by Minangkabau. Thus, on the generation of subjective emotional meta-experience specifically, they wrote: "Here we hypothesized that cross-cultural variation would be more likely than cross-cultural consistency" (p. 973).

I do not want to exaggerate the degree of cultural relativity here. Categories of emotion in different languages are often similar. The English word *fear* is very like (although not identical with) the Ifaluk word *metagu* (Lutz, 1988). Most such scripts are defined around universal human scenes and dilemmas, such as sexual infidelity, danger, dependency, and so on. The concepts expressed by a natural language mix the universal and the culture-specific in ways that are difficult to untangle (e.g., *mehameha* is a Tahitian word for "fear of ghosts"), because the human creators of those concepts did not have the scientific machinery needed to untangle them. Further, there is great similarity across cultures in the raw data underlying the categorization (i.e., core affect, attribution, appraisal, and behavior). Nonetheless, differences exist and may be important. Although only anecdotal, evidence from Tahiti illustrates the possible consequences of such differences, for the Tahitian language has no word translatable as "sad." Levy (1973) described a Tahitian man whose wife and children left him to live on another island. The man felt "not good" and "without energy" (p. 303). Levy interpreted the man as sad over his loss. The man, however, thought of himself as ill and sought medicine; he made no connection between his core affect and his loss of wife and children.

*Testing the account.* Admittedly, testing a nativist or a constructionist account of subjective experience empirically is difficult, and evidence is scarce. The solution is to proceed in a



scientific manner, stating theories, deriving predictions, and testing those predictions. It might help to state four predictions from a constructionist account.

First, as in James's (1884) reversal of common sense, the hypothesis of emotional meta-experience is that various components occur before one interprets oneself as afraid. There is widespread evidence to argue that one's statements about oneself are often after-the-fact interpretations of behavior rather than direct readouts of a prior cause of behavior. Hypnotic subjects (Hilgard, 1986) and split-brain patients (Gazzaniga, 1989) have provided compelling examples of people creating clever fictions to rationalize their own behavior. Similar examples can be predicted for emotional meta-experiences.

Second, the proposed account is consistent with feedback theories of emotion. Indeed, there is no incompatibility between the various feedback mechanisms (visceral, somatosensory, facial, behavioral) or between them and the various cognitive (attribution, appraisal) mechanisms. Heilman (2000) analyzed the available evidence on the various feedback mechanisms and concluded that the power of any single source of feedback is weak. Cumulatively, however, they might be powerful. Rather than see the field as populated with a set of competing theories, imagine that emotional meta-experience is based on all the information available. One consequence would be that the question becomes less theoretical and more empirical: What initiates the comparison of one's current state with a script? What information does the comparison rely on? Which information is more heavily weighted? Whereas current experiments focus on whether a specific type of feedback can influence experience, future research might estimate the relative influence each type exerts under various circumstances.

Third, core affect is raw data in the process producing emotional meta-experience. As mentioned, correlational evidence shows that self-reports of discrete emotions are correlated highly and systematically with reports of core affect (Feldman Barrett & Russell, 2000; Russell & Mehrabian, 1977; Watson and Tellegen, 1985). There has been precedent for hypothesizing that the arousal component of core affect contributes to emotional meta-experience (Schachter & Singer, 1962; Zillman, 1983), although arousal was not conceived of in exactly the way done here. Evidence shows that arousal (e.g., due to prior exercise) can influence a person's perception of him- or herself as angry or in love (Dutton & Aron, 1974; Zillman, 1983; Valins, 1966). Missing, however, is evidence showing that pleasure-displeasure contributes to self-perception of emotion.

Fourth, perhaps the process of emotional meta-experience is not as purely information driven as it has been portrayed here so far. Emotional meta-experience is mediated by an interpretive process, and that process might be subject to motives and biases. Some might avoid interpreting themselves as jealous, envious, ungrateful, or smug, because doing so would put them in a bad light. A man for whom fear is inconsistent with his self-image might see himself as prudent rather than as afraid. Demonstration of such biases would provide evidence for the present account.

*Function.* In common sense, emotional meta-experience is plainly functional: It causes physiological activation, emotional expression, fight or flight, and so on. It is this commonsense view that James (1884) challenged, but his alternative provided "emotion" (emotional meta-experience) with no function and is therefore subject to the criticism that without a function it is unlikely to

have evolved. The present account invites the same criticism, for emotional meta-experience need play no role within the emotional episode. Why do human beings monitor and categorize themselves if the resulting meta-experience is not necessary for core affect, attribution, or emotional behavior?

Emotional meta-experience appears to have several functions. During an emotional episode, working memory can be overwhelmed with details of the current situation. Most emotional episodes involve violated expectations and difficulty in coping. Emotional meta-experience is the construction of a coherent narrative, interpreting, packaging, and labeling the episode—thereby integrating this episode with general knowledge. Doing so serves cognitive economy on line (i.e., as the events are occurring) and, later, in memory by categorizing one's life events in order to learn from them. Another immediate function is emotion regulation.

### *Emotion Regulation*

The phrase *emotion regulation* has been used in psychology with different meanings or, occasionally, with no clear meaning at all. Here I distinguish it from *affect regulation*. *Emotion regulation* is the attempt at self-control that occurs during an emotional episode and that is mediated by emotional meta-experience. Emotion regulation is not here thought of as controlling the fear itself, whatever that would mean. Instead, emotion regulation is the management of core affect, appraisals, actions, and facial and other expressions, all directed at an Object, for various goals, including presentation both to self and others.

Although emotional meta-experience plays no necessary role in the emotional episode itself, it can play a role: I am afraid, and I should not be; I can attempt to be or at least appear braver. I am happy and that is good (or sinful or inappropriate or whatever). Hochschild (1983) described the "feeling rules" by which society prescribes the emotions appropriate to certain situations and roles (men should not be afraid; happiness is the normal state). Emotional meta-experience serves to evaluate and therefore regulate oneself with respect to those rules.

### *Dissociations*

As already described, facial patterns said to signal fear are not predicted here to be closely associated with any one specific pattern of autonomic activity, of appraisal, or of flight and avoidance behavior. Appraisals of an event as dangerous need not lead to other components of fear (driving along the highway, Alice routinely perceives dangers and avoids them). The present account does not predict strict independence among the components, for there are links among them, but across all cases the correlations are expected to be low. Higher correlations are predicted in two circumstances: First, two valid measures of the same component (e.g., two measures of the brow raise) would be highly intercorrelated. Second, because emotional meta-experience is a perception based on the other components, it should correlate with those components.

The empirical basis of the present analysis is evidence that the components are not as closely associated as assumed in everyday thought. Bradley and Lang (2000) have repeatedly emphasized that the evidence contradicts the traditional view of emotion on just this point:

If individuals are confronted by a stimulus that they reportedly fear and we measure self-rating of distress, the extent of avoidance (change in proximity to the stimulus), and autonomic arousal (heart rate or skin conductance change), the covariation among response systems seldom accounts for more than 10–15% of the variance (e.g., Lang, 1968; Mandler et al., 1961). Dramatic examples of such response discordance have been formalized in the catalogue of psychiatric symptoms. (p. 244)

Early research that uncovered surprisingly weak associations among components of supposedly unified emotional responses (Lang, 1968; Lazarus, Speisman, Mordkoff, & Davison, 1962; Lazarus, Tomita, Opton, & Kodama, 1966; Mandler, Mandler, Kremen, & Sholiton, 1961; Weinstein, Averill, Opton, & Lazarus, 1968) has now been replicated in a variety of contexts (Hess, Banse, & Kappas, 1995; Hodgson & Rachman, 1974; Lang, 1988; McGhee, 1977; Mineka, 1979; Rachman, 1984; Rachman & Hodgson, 1974). Averill (1982) found that angry persons physically aggressed only 10% of the time and verbally aggressed only half the time. Components of facial expression do not cohere with each other or with other parts of the emotion (Camras, 1992; Fernandez-Dols & Ruiz-Belda, 1997; although see Izard, 1994), nor do peripheral physiological changes (Cacioppo et al., 2000; Zajonc & McIntosh, 1992). Complementary evidence comes from neurophysiological evidence that avoidance behavior can occur independently of the neural processes involved in cognitive appraisal of the eliciting stimulus and independently of the conscious experience of fear (LeDoux, 1996).

Defenders of the more traditional view of emotions as highly cohering packages have suggested methodological or data analytic reasons for lack of coherence (e.g., Izard, 1994; Rosenberg & Ekman, 1994). Nonetheless, coherence remains to be demonstrated. Moreover, Reisenzein (2000) recently addressed these technical concerns in a study of the coherence among four components of surprise (cognitive appraisal as unexpected, emotional meta-experience of surprise, reaction time, and facial expression). Reisenzein found that

even with an optimal data analysis design (raw data, within-subjects), the average linear correlations between the different surprise components were—with the important exception of the correlation between [a cognitive appraisal of] unexpectedness and [emotional meta-experience of] surprise ( $r = .78$ )—only low to moderate, ranging from .19 ([reaction time]–expression) to .46 (surprise feeling–expression). (p. 28)

### *A Multiplicity of Patterns and Their Varying Resemblance to Several Prototypes*

Prototypical cases of fear are not a random sample of all cases of fear. Instead, they are selected after the fact to resemble most closely the mental script for fear. They are therefore just those cases in which the components cohere the most. They are the cases that come to mind when the words *emotion*, *fear*, and so on are mentioned and are the cases that theorists have believed they must explain. In describing a prototypical emotional episode of fear, I might have given the impression that frightened people routinely respond in the scriptlike fashion depicted. Evidence indicates that this is not the case. Prototypical cases are rare (Russell & Fehr, 1994). A corollary of the dissociations among the ingredients is that many different patterns actually occur.

To describe emotional life adequately it is necessary to go beyond prototypes. Emotional life consists of the continuous fluctuations in core affect, in the frequent attribution of core affect to a single Object, in pervasive perception of affective qualities, in behaviors in response to the Object. If these components are but weakly correlated, then very many patterns occur. On occasion, these ingredients happen to form a pattern that fits the prototype. More often, the pattern formed does not fit any specific prototype well. Instead, the actual pattern fits various prototypes to varying degrees (Russell & Bullock, 1986; Russell & Fehr, 1994.) The degree to which a person's current condition resembles the prototype of fear is the degree to which it is a case of fear. Cases that resemble it precisely are said to be the blue-ribbon emotions. This is parallel to the way in which emotional meta-experience is formed on the basis of the other components and parallel to the way in which one person categorizes the emotions of others. In each of these cases, resemblance is an external fact about the person's state and not an explanation of that state. The internal facts consist of the components and the pattern among them.

What gives the appearance that emotions divide naturally into discrete packages? As an analogy, consider a normal deck of 52 playing cards. When shuffled and dealt, the cards form patterns. In the game of poker, specific patterns have been defined and given a special status: pair, straight, flush, and so on. Many other patterns (e.g., a hand that includes all prime numbers or all even numbers) also occur but are not defined within the game of poker and might go unnoticed by most poker players. Other games define other patterns. In like manner, different societies have lexicalized somewhat different patterns in their emotion vocabulary. Even when card hands are dealt randomly, when a series of numbers is random, or when a series of basketball hits and misses is random, observers perceive patterns. In emotional life, the mixtures of emotions' components are not random, but even if they were, people would likely divide them into discrete categories on the basis of perceived patterns.

The traditional view accords the prototypical exemplars a privileged status as revealing nature's preselected packages. Deviations from the prototype must then be accounted for by some additional mechanism such as inhibition, masking, society's rules, socialization and the like. (For instance, an association between facial expression and emotional meta-experience is assumed; their dissociation might be explained by invoking a "display rule.") In contrast, in the analysis offered here, prototypical emotional episodes are no more natural than atypical patterns. They have no special status, except in the eye of the beholder as exemplifying the prototype. Associations rather than dissociations must therefore be accounted for. The present analysis focuses attention on the non-prototypical patterns as genuine events in a person's emotional life and as a neglected source of evidence on the nature of emotional life.

### *Explaining the Pattern*

The packaging of the components into a unified whole seems to require an explanation (and such is the function of the box labeled "emotion" in the traditional view illustrated in Figure 2). On the present account, each instance of an emotional episode (prototypical or not) is psychologically constructed on the occasion of its occurrence. As suggested by dynamic systems theorists (Camras,

1992; Fogel, 1993), no overall pattern is fixed ahead of time. No mechanism is required to explain their packaging into a whole. Return to the game of poker. If the cards are shuffled and hands dealt fairly, then various patterns will be seen—pairs, straights, flushes, and so on. Nevertheless, no pair-producing, straight-producing, or flush-producing mechanism is needed to explain their occurrence (except in cheating). In an analogous manner, each of the components requires a generative mechanism, but the final patterning among the components requires no additional mechanism. Of course, the analogy with poker is too extreme. In a fair game of poker, each card is statistically independent of the others. In an emotional episode, components influence each other and emotional meta-experience is a perception of the other components.

This perspective provides a way of thinking about fear, anger, and other seemingly discrete emotional episodes as configurations constructed on the fly out of more fundamental ingredients. Two claims are being offered. The first is that such a way of thinking is not incoherent or ruled out by available evidence. If so, then the scientific principle of parsimony requires that the postulation of additional entities or mechanisms, the emotional homunculi of basic emotions, be demanded by compelling evidence. That evidence is missing. The second and the stronger claim is that the present account is a good account of emotional episodes. Although not without precedent (James, 1884; Kagan, 1979; Mandler, 1984), this approach must be considered speculative. I am convinced of the first claim, and although I believe the second as well, much more evidence is needed.

## CONCLUSION

Much remains to be done to develop the proposals offered here. Pleasure, activation, attribution, and the ecology of emotional life require much more empirical attention. The contrast of the present approach with that centered on basic emotions could stimulate renewed research on dissociations and coherence among the components of a prototypical emotional episode as well as on facial and physiological signatures of specific emotions.

Much also remains to be done on a conceptual level. Details on empathy, displeasure motives, and emotional responses to virtual reality, art, and drama are needed. I have considered here emotion only at a slice in time or during a brief episode, but much of our emotional life necessarily takes time. There are individual differences in core affect and its volatility that should result in subtle but pervasive differences. Temperament, attitudes, passions, love and hate, and, unfortunately, psychiatric emotional syndromes endure. The proposed framework can, indeed must, be extended over time, but that remains for the future. The analysis outlined here was entirely psychological. Biological substrates and evolutionary history remain to be added. Similarly, this article little more than hints at the role of society and its institutions and culture. Emotions involve socially defined roles and concepts (Averill, 1982), and the proposed framework must be extended to detail these relations.

Whatever the fate of the proposed framework, this article suggests a general approach to the topic of emotion. One of the mysteries of psychology is how it has been possible to define and construe emotion in such apparently incompatible ways, from biologically fixed modules similar to reflexes to attitudes to cognitive structures to socially constructed roles. If emotion were a

well-defined natural kind with different theories of emotion competing head to head over the same territory, then scientific scrutiny should have rejected the false alternatives long ago. If, instead, the word *emotion* refers to a heterogeneous cluster of loosely related events, patterns, and dispositions, then these diverse theories might each concern a somewhat different subset of events or different aspects of those events. Theories about different things are not in competition, and empirical scrutiny could easily find evidence for each.

This construal of the word *emotion* offers a way of reconciling seemingly incompatible theories of emotion. For example, James (1884) and Cannon (1927) offered ostensibly competing theories of emotion. Replacing the word *emotion* in James's theory with *emotional meta-experience* and replacing it in Cannon's theory with *the neural substrate of emotional behavior* renders the two compatible. The two theories are about different topics. A similar substitution can help reconcile latter-day variants of these two theories. Although Schachter and Singer (1962) did not take this view, their theory seems more plausible when *emotion* is replaced with *emotional meta-experience*. Tomkins's (1962) theory appears more plausible when *emotion* is replaced with *prototypical emotional episode*. Of course, rendering two seemingly conflicting theories compatible in this way does not make either correct. Still, once rendered compatible, perhaps they can be combined in a way that builds on their strengths and avoids their weaknesses. The framework outlined here is not a new theory of emotion but the specific combination of prior theories that I find most promising. Perhaps its value will be in stimulating its critics to propose other combinations.

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