

## Emotion, core affect, and psychological construction

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As an alternative to using the concepts of emotion, fear, anger, and the like as scientific tools, this article advocates an approach based on the concepts of core affect and psychological construction, expanding the domain of inquiry beyond “emotion”. Core affect is a neurophysiological state that underlies simply feeling good or bad, drowsy or energised. Psychological construction is not one process but an umbrella term for the various processes that produce: (a) a particular emotional episode’s “components” (such as facial movement, vocal tone, peripheral nervous system change, appraisal, attribution, behaviour, subjective experience, and emotion regulation); (b) associations among the components; and (c) the categorisation of the pattern of components as a specific emotion.

**Keywords:** Emotion; Core affect; Psychological construction; Facial expression; Emotional behaviour.

In fear, your heart races, your palms sweat, your face broadcasts fear, you scream, and you flee. But, does this happen in all cases of fear? Most? In the realm of the emotions, reflex-like consistency is the exception rather than the rule. The rule is differences—both between and within individuals and situations. As Barrett (this issue) describes, there is more variety within fear and other categories of emotion than our standard theories suggest—indeed, more than commonsense supposes. To understand these differences in emotion requires a conceptual framework that anticipates differences and that supports a more idiographic approach to research on them. It requires a new way of thinking about emotion. This article outlines one such approach.

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The major barrier to progress is not our ignorance but our illusion of knowledge. Increasingly, our traditional “knowledge” about emotion is being questioned at the most fundamental level. The traditional assumption that emotion is a unitary event is challenged by the idea that emotion is a multi-component process, with no one component identified with the emotion (Scherer, 2001). A similar challenge is Clore and Ortony’s (2008) argument that an emotion is an emergent construction rather than a latent entity and their call for a shift from discussing “emotion” to discussing “affective processes”. Minsky (2008) called for wholesale remodelling of this field. Kagan (2007) challenged the language used in this field and its methods for gathering knowledge.

There are many exciting avenues to explore and new ways to think about emotion. My version has been presented at length with supporting evidence elsewhere (Russell, 2003, 2006). Here I clarify, develop and defend that approach. First, however, I briefly summarise some problems with the traditional way of thinking about this topic.

### THE STRANGLEHOLD OF COMMON SENSE

Citing Tomkins (1962, 1963) and his followers (Ekman, 1984; Izard, 1977), much of the psychology of emotion has been guided by a highly productive research program that I call basic emotion theory. The central idea of basic emotion theory is that human nature includes a small number of qualitatively distinct kinds of emotion, each of which produces (or is) a distinct, tightly organised and recurring pattern of manifest components. Basic emotion theory is a plausible approach that has stimulated the gathering of much evidence. As often happens in science, however, the evidence has revealed surprising problems, which I summarise in Table 1. No one or two problems are fatal, but, altogether, the problems point to a poor prognosis for this type of theory.

Rather than elaborate on the problems listed in Table 1, let me instead suggest a diagnosis of their source. The problems encountered by basic emotion theory are not philosophical but empirical. They are problems encountered by most analyses of emotion, modern and ancient, and in diverse disciplines. They stem from the preconceptions that underlie not only much of scientific thinking but much of our everyday thinking about emotion. The source is deeper than simply the answers provided by basic emotion theory, which is, after all, just a more explicit and systematised version of common knowledge. The problem already exists in the questions that this family of emotion theories attempts to answer. Questions such as: What is an emotion? How many emotions are there? What are they? How

TABLE 1  
Problems uncovered in studies of basic emotion theory

<i>Area</i>	<i>Problem</i>
Culture	There are cultural differences in all known aspects of emotion.
Language	Different languages lack a one-to-one correspondence between emotion terms.
Definitions	Theories based on traditional assumptions have not led to increased precision of terms. Each term lacks inclusion and exclusion rules.
Blends	Basic emotions rarely occur alone, and yet no accepted theory of how they co-occur or blend has been developed.
Facial expressions	Failure to find convincing evidence that emotions produce "facial expressions of emotion".
Autonomic nervous system	Failure to find convincing evidence of a unique pattern for each emotion in the autonomic nervous system.
Subjective experience	Failure to find separate factors corresponding to basic emotions in studies of self-reported emotional experience.
Emotional behaviour	Failure to find a class of behaviour common to instances of a given emotion.
Coherence	Dissociation rather than predicted associations among manifest components.

are they generated? How does one emotion differ from another? What are their manifestations? What are their effects/functions?

Long before any psychologist asked these questions and theorised about the answers, everybody who speaks English knew about anger, fear, jealousy and other emotions. Indeed, we simply opened our eyes and saw a friend become frightened. We saw ourselves erupt in anger. We felt sad. Everyone knows that smiles mean happiness, tears mean grief, scared people run away, and angry people fight. Everyone knows that emotion is the antithesis of reason, emotional behaviour the antithesis of deliberate action. The science of emotion began with these compelling perceptions based on and reinforcing a set of preconceptions.

But, history and science combine to show us that what we see does not always reveal the way things are. We open our eyes and see one line longer than another in the Müller–Lyer figure, even though we know they are equal in length. We open our eyes and see the sun rise, move through the sky, and then set. Except, of course, that it does no such thing. "Seeing" is a powerful force on our thinking, and centuries of scientific work were needed to replace a geocentric theory of the solar system with a heliocentric one.

Science begins in the everyday human attempt to understand the world. Infants are scientists (Gopnik & Meltzoff, 1997) who develop their theories of the world filtering data through human perceptual and cognitive processes. As science progresses, however, everyday folk theories are typically left behind. Some everyday concepts are forged into scientific concepts; some

not; all must be scrutinised. Contrast traditional beliefs with what is now known about the size of the universe, the age of planet earth, the origin of species, or quantum mechanics. None of these breakthroughs in science has been easy or without powerful resistance.

In the realm of emotion, scientific progress has been hindered by our everyday vocabulary and the assumptions it carries. One source of problems is the very word *emotion*. Frijda (2008) wrote, “The psychological point of view is that ‘emotion’ represents a meaningful and necessary concept” (p. 68). Despite decades of attempts to forge the concept of emotion into something scientific, we are still left with too many problems. The everyday folk concept of emotion is culture specific and vague and comes with misleading presuppositions. Its extension is heterogeneous, so that writers have tried to subdivide it into basic and non-basic emotions, affects, sentiments, moods, and so on, but with little consensus. Emotion is divided into joy, anger, fear, jealousy, and so on—but the problem lies in the “and so on” because no one knows where the border is between emotions and non-emotions. The everyday concept of emotion presupposes: that an emotion is separate from its causes, its manifestations, and its consequences, although different writers have proposed equating emotion with one or more of these; that an emotion (or its equivalent, an affect programme or neural module) is an entity that causes these manifestations (expression, instrumental action, peripheral nervous system changes, and so on); that emotion is an entity that is qualitatively different from other psychological entities, especially the mechanisms of rational thought, but also behaviour, conation, and so on. From these assumptions it follows that the word *emotion* (perhaps after some tidying up) demarks a special scientific domain of inquiry. Writers continue to seek the essence of emotion and to ask unanswerable questions.

Anger, fear, jealousy and other concepts for kinds of emotion are similarly embedded in a way of thinking that must similarly be questioned. They too are vague, culture specific, and come with misleading presuppositions. Commonsense presupposes separate discrete emotions, each a thing-like entity with causal powers. Thus anger is “expressed” in the face and voice, is “felt” in consciousness, “causes” the heart to speed up, and “urges” us to intemperate action. It is further assumed that because the various components stem from a single entity, they cohere in tight packages, each named in natural language. As a result, it is assumed that different emotions are separable into scientifically useful discrete kinds, each captured by a familiar word. Each has an essence.

Abandoning the concepts presupposed in the language we speak—indeed, in our perceptions of the world—as scientific tools is not easy. Without these concepts, it is difficult to speak or write about this domain. Rejecting these concepts as scientific terms appears to deny commonsense and obvious facts of the case. Doing so appears to abandon not only the answers our field has

developed, but the very questions that motivated our work and the optimism that we will soon succeed. Loss of vocabulary and questions leaves theorists with a sense of vertigo. Critiques of current practices have then been dismissed as anti-emotion theories. Zachar (2006) characterised my alternative as Eliminativist. Colombetti (in press) suggested that my alternative implies that “emotions have no existence independent of our categorization” (p. 2). For many readers it might seem as if I am proposing that we toss out everything of importance. So, what remains?

In abandoning the geocentric theory of the solar system, some facts survived the move to a heliocentric system: the earth and sun remain, their relative positions remain, motion remains, observed time between events remain. Similarly, in abandoning an emotion-centric view, many of our observations about events called emotion remain. Indeed, all the observable phenomena remain in my account: faces move, prosody changes, hearts speed up and slow down, people aggress and they flee—all such events really occur, independent of our categorisation. Some people see anger in faces of others and they feel anger in themselves<sup>1</sup>—these events really occur, but do imply categorisation via the folk concept of anger. Emotion’s manifestations (although on my account the phrase is a misnomer) are real and important and cannot be eliminated. A scientific account of these manifestations can be had without the concepts of emotion, anger, etc., used in a scientific role and without assuming them to be manifestations of something. Even the concepts of emotion, fear, anger, and the rest, remain—although as everyday folk concepts rather than as scientific ones. In that role, they are important topics, much as are all other folk concepts from *angel* to the *zodiac*. *Anger, disease, emotion, marriage, meal, money, poker, tax, tornado, soap* and many other folk concepts play a role in human affairs that must be understood.

On my account, events now called *emotion* (in human adults and infants and non-human animals) bear a family resemblance to one another. Although it does not follow that emotion/not-emotion divides nature at its joints, the word *emotion* does point in an interesting direction, and the events it refers to are real and important. The same can be said for fear, anger, and the like.

In short, on my account, much remains but is understood in a different framework. My account does not allow the concept of emotion to determine boundaries of the domain to be explained. My account postulates no single

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<sup>1</sup> To be clear: when I write of “seeing” anger or another emotion, of “seeing” two lines in the Müller-Lyer figure as of unequal length, or of “seeing” the sun set, I mean to describe what the perception is like for the perceiver. In the realm of the emotions, we see faces move, which they really do, hear the voice change, which it really does, see palms sweat, which they really do, and so on, all in some context. We then name the combination of these events as anger, thereby inferring anger as their cause.

causal entity—the emotion of anger, fear, or their neural equivalent, an affect programme—to explain the occurrence of the manifest components of that emotion or to explain the pattern or correlations among these components. In the remainder of the article, I summarise my account by clarifying two key concepts: Core affect and psychological construction. Core affect is part of, but not the whole of, what are called moods and emotions. Psychological construction is an umbrella term for the set of processes that produce a token emotional episode's manifestations and its categorisation as an emotion.<sup>2</sup>

### CORE AFFECT

Core affect is a pre-conceptual primitive process, a neurophysiological state, accessible to consciousness as a simple non-reflective feeling: feeling good or bad, feeling lethargic or energised. There is something it is like to feel core affect. Its presence in consciousness varies from being focal to peripheral to out of sight. A structural description of core affect is an empirical matter, and I have proposed a circumplex with the two underlying dimensions of pleasure–displeasure and activation–deactivation (Russell, 1980, 2005; Yik, Russell, & Steiger, 2008). Although two-dimensional, core affect is, subjectively, a single feeling. That is, the two dimensions combine in an integral fashion to form one unified feeling. Pleasure and arousal combine to form the single feeling of ecstasy, for example. An analogy is the sensation of a specific colour, such as the red of the autumn leaf outside my window. The dimensions of hue, saturation, and brightness combine in an integral fashion to form one unified sensation of any particular colour.

It may help to say what core affect is not. So, here is a series of conceptual distinctions. The idea is to point to ostensibly different phenomena, without precluding the possibility that core affect is contingently related to them.

Core affect, although it may be empirically involved, is not a judgement that something is morally good or bad or tactically advantageous or harmful. Core affect has been shown empirically to be related to changes in the autonomic nervous system, facial and vocal behaviour, instrumental behaviour, cognitive processes, reflexes, and a host of other things (Russell, 2003). Still, core affect is conceptually distinct from them.

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<sup>2</sup> The influence of the concept of emotion is pervasive and subtle. For example, critics of my account (Russell, 2003) have mistakenly assumed that mine is a “dimensional” rather than “categorical” account of *emotion*, i.e., that the domain of emotion is to be subdivided by dimensions of core affect rather than by discrete categories such as fear and anger. Another false interpretation is that core affect carries the same assumptions that emotion does, i.e., that core affect must account for facial and vocal expressions, autonomic changes, emotional behaviour and the like.

Core affect is not a substitute term for emotion, nor is it the essence of emotion; it is not a necessary feature of emotion.<sup>3</sup> Prototypical emotional episodes are said to begin and then, after a short time, end. In contrast, one is always in some state of core affect, which simply varies over time, sometimes slowly, sometimes rapidly, without beginning or end. Prototypical emotional episodes are directed at something (one is angry with, afraid of, or sad about something). In contrast, core affect is not necessarily directed at anything. (In this regard, core affect is closer to the English word *mood* than to *emotion*, although mood prototypically is long lasting and mild.) Core affect per se can be free floating (as in feeling down but not knowing why), but it can come to be directed at something. The full experience of core affect can thus become intentional in the philosophical sense, in much the same way that the full experience of a pain can become intentional (Searle, 1992, p. 251).

Core affect is also distinguishable from the affective properties we perceive in objects, events, and features. We perceive objects to be beautiful, ugly, awful, soothing, and so on. We perceive how pleasant or unpleasant or how energising or soporific something promises to be. Typically, perceiving something to be beautiful is a pleasant experience, perceiving something ugly unpleasant. And, such perceptions are logically related to core affect: to perceive something as pleasant is to judge it capable of producing pleasure. Nevertheless, I want to allow the possibility that the perception of an affective quality can occur even when we're not personally moved by the object or event. That is to say, such perceptions are not, by definition, accompanied by changes in core affect. Distinguishing the two thus leaves as an empirical hypothesis the idea that core affect is involved in the perception of affective quality.

Even when non-intentional, even when we have no clue why we feel as we do, core affect is caused. Individuals vary greatly in how their core affect is experienced (Barrett, this issue) and changes over time (Kuppens, Van Mechelen, Nezlek, Dossche, & Timmermans, 2007). Core affect changes in response to many simultaneous influences. Sometimes the influence is a single powerful and obvious external event, as in James's prototypical

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<sup>3</sup> Core affect does provide the pleasant or unpleasant hedonic tone to those token emotional events that have that tone. Core affect is also a central feature of the mental *prototypes* of some emotions but not a necessary feature of all cases of those emotions. For example, cases of fear can be found without a core affect of unpleasant arousal, but they are mediocre or borderline rather than prototypical cases. (Fear without arousal: contemplating a distant danger; fear without displeasure: thrill seeking.) Charland (2005) underscored the distinction between core affect and emotion by observing that, on Panksepp's theory, some emotions (lust, seeking) can, depending on context, involve very different values of core affect prototypically. Of course, the concepts of emotion, fear, and so on, could be redefined for scientific purposes such that core affect is a necessary feature, but I'm not advocating that route.

emotional episode of the bear in the woods. More typically, however, there are many simultaneous influences, including some beyond human ability to detect. Some influences are internal, such as diurnal cycles, hormonal changes, and immune responses. Core affect is changed directly by chemicals, both uppers and downers and euphoric and dysphoric drugs. Indeed, it is precisely the core-affect-altering properties of drugs that make them objects of abuse or avoidance. Addicts seek out drugs that make them feel good, and some people fail to take needed medicines that, as a side effect, make them feel bad. Core affect is altered by real events, but also by imaginary, remembered, and foretold events; core affect responds to virtual reality in art, imagination, fantasy, and entertainment.

There are too many such influences for a person to track them all and hence to know what caused his or her current core affect. So, although we often have a good idea of why we feel the core affect we do, we sometimes don't, as in free-floating emotions and moods and everyday feelings. For this reason, attributions and misattributions often play a role in emotional episodes (Neumann, 2000; Weiner, 1985).

Core affect appears to have many of the features of modularity (Faucher & Tappolet, 2006): fast, mandatory, unique output, an evolutionary explanation, dedicated brain circuitry, and encapsulation (Russell, 2006). At first blush, encapsulation (an example of which occurs in the Müller-Lyer illusion in which one simultaneously knows that two lines are of equal length and yet sees them as unequal) seems an unlikely property of core affect. After all, cognitively processed information can be a powerful influence on core affect, obviously: core affect responds to news of winning a lottery, learning of the death of a loved one, reading about injustice, and pondering a distant danger such as global warming—all of which require cognition. Such examples, however, also have another feature in common: conscious attention to the information. When the information fades from consciousness, its influence on core affect similarly fades. Consider the excitement of winning the lottery. If the news continues to invade consciousness (shopping, congratulatory remarks, memories), then it continues to shape core affect. But if one is distracted such that thoughts about the win are pushed out of consciousness, then the excitement fades. Thus, I offer the hypothesis that core affect is largely encapsulated from cognitively processed information, with the major exception of knowledge seen through the window of consciousness. Thus encapsulation here means that knowledge per se does not alter core affect unless we are conscious of it. Encapsulation thus resonates with the response of core affect to virtual reality: in both cases, core affect responds to what is in consciousness, rather than to what is known to be real.

## PSYCHOLOGICAL CONSTRUCTION

The science of emotion has historically sought a single process that explains (or defines) emotion and that distinguishes emotions from non-emotions. Some of the proposals are that emotion requires (or is): somatosensory feedback from the bodily reaction to an emotional stimulus; the output of a small set of pre-wired reflex-like neural modules (affect programmes); the enactment of a core relational theme; cognition (labelling, attribution) triggered by bodily arousal; the valenced response to a set of appraisal processes; an act of categorisation; and the enactment of a socially constructed role. The issue I want to raise is not the precise nature of these theories—I have undoubtedly oversimplified them—or the proper verb (*requires* vs. *is*). The issue is the assumption that the number of processes needed to explain or define emotion is one.

The concept of emotion lacks necessary and sufficient features. Given the heterogeneous nature of the extension of emotion, I believe that each of these theories is likely true for some cases, but that no one theory will be true for all cases called emotion without being true for pretty much all non-emotional psychological states as well. My proposal, psychological construction, is thus not the claim that emotion requires (or is) core affect, an act of categorisation, a socially constructed role, or an attribution of core affect to an event. Indeed, what gets psychologically constructed is not emotion as a generic process or anger, fear, etc., as generic kinds; rather, what gets psychologically constructed are individual token events, which may (or may not) then be classified as emotion, fear, anger and the like by means of a folk concept.

Each actual instance called an emotion is real and requires an explanation. Psychological construction is not just another such single mechanism offered as an explanation for all and only cases of emotion. Psychological construction is based on assumption that no one specific mechanism explains all, or even a good number, of cases called emotion. Each token's components are cobbled together on the fly. Actual instances called emotion are constructed in a variety of ways, depending on the particular circumstances of the particular individual.

The phrase *psychological construction* is meant to contrast both with biological construction, assumed in basic emotion theory, and with social construction, often assumed by anthropologists and sociologists. Both biological and social construction seek the origin of emotion as one generic process and seek the origin of fear, anger, and so on, each as one general mechanism. Both thus assume that all emotional episodes are largely predetermined, by nature in the former and by culture in the latter. On my account, both nature and nurture are essential, but the important point is that each particular instance of emotion is not predetermined but comes

together at a psychological level at the time of its occurrence. There is no one general mechanism. Put differently, the traditional assumption is that a “theory of emotion” will differ from a theory of cognition, or behaviour, or conation. My claim, in contrast, is that any theory that explains all cases called emotion will be close to the whole of psychology, a theory that of course will not be limited to emotion but will extend to all psychological processes.

My proposal raises three questions: (1) how to explain any given emotional episode, each token event; (2) how to explain the patterning of emotion’s components; and (3) how to explain our compelling perceptions that particular episodes are instances of a general category, such as fear or anger.

### Explaining emotion’s manifest components

So, how specifically does psychological construction explain any given event called emotion? The first step is to recognise that each token consists of manifest components (Scherer, 2001, this issue), such as facial and vocal expression, changes in the autonomic nervous system, subjective experience, and so on. Let us begin by examining each component, with an eye toward how we might begin to explain it without positing an emotion as its cause. Doing so also explains why there are individual and situational differences that occur even within a given category of emotion.

*Facial and vocal expressions.* For the face or voice to “express” emotion implies, among other things, that the emotion causes the facial or vocal changes. Explanations of facial and vocal changes in terms of emotion have dominated the research agenda, but alternative explanations are starting to appear. Faces move as part of perception: to look away, to stare, to smell, etc.: We wrinkle our noses at smells, gag at noxious tastes. Faces move as part of cognitive processes such as attention and appraisal (Ortony & Turner, 1990; Scherer & Ellgring, 2007; Smith & Scott, 1997). Faces move as part of action, including speech and other goal-directed actions: We turn our faces in the direction we are heading, and we make faces as we tell stories. Some facial signals evolved (either genetically or epigenetically) to guide social interactions, such as threat, greeting, or submission (Fridlund, 1994). The face and voice change with general arousal and positive versus negative core affect (Lang, Greenwald, Bradley, & Hamm, 1993). My hypothesis is that facial and vocal behaviour during an emotional episode can be explained through such non-emotional processes (Russell, Bachorowski, & Fernandez Dols, 2003).

*Autonomic nervous system (ANS).* The search for an ANS signature for each emotion is based on the commonsense assumption that our heart races because of fear, and so on. Such signatures have not been found (Larsen, Bernston, Poehlmann, Ito, & Cacioppo, 2008), and, more generally, ANS changes can be accounted for without attributing them to an emotion. ANS activity is on going, with both general features (degrees of arousal) and specific chores. Perhaps one can also detect broad response patterns, mobilisation for action versus relaxation for homeostasis or perhaps preparation for approach versus avoidance (Larsen et al., 2008). Long ago, Lacey (1950, 1967) found individual- and context-specific patterns of autonomic response.

*Emotional behaviour.* In the traditional way of thinking, emotions cause behaviour: we strike because we are angry, we flee because we are frightened, and so on. James (1884) turned the causal arrow around: we are angry (or, more precisely, perceive ourselves to be angry) because we strike and are frightened because we flee. Baumeister, Vohs, DeWall, and Zhang (2007) reviewed evidence that questioned whether there is any causal arrow between anger and aggression, or between fear and flight, or, more generally, between emotion and behaviour. Scherer (this issue) cites as a feature of emotion the looseness of its link to behaviour.

Fight, flight, and other emotional behaviour can be accounted for without emotion. Core affect, even when outside consciousness, influences behaviour (Winkielman, Berridge, & Wilbarger, 2005). Appraisal of the current situation can lead to formation of goals and plans and their execution (a process that can be implicit as well as explicit, and quick and ill advised as well as slow and wise). Strack and Deutsch (2004) brought together various lines of evidence and theorising to propose a two-system account of behaviour. An “impulsive system” influences behaviour through associative and motivational mechanisms, whereas a “reflective system” influences behaviour through a knowledge-based mechanism. On their account, emotional behaviour is not thought of as resulting from an emotion, but as the joint product of these two interacting systems.

*Experience of having an emotion.* Persons sometimes feel afraid, angry, sad, and so on. Such conscious feelings are real, but we need not then go on to assume that such feelings are veridical detections of (caused by) an emotion. On my alternative account, emotion is not their cause. Rather, as James (1884) proposed, such experiences are perceptions: to feel afraid is to perceive oneself as afraid (see Prinz, 2004). More technically, I characterised this feeling as a meta-experience because the raw data on which it relies include other experiences: core affect, somatosensory feedback, appraisal of the eliciting event, attribution, beliefs, desires, plans, and behaviour.

Similarly, Lambie and Marcel (2002) characterised the experience of having an emotion as a second-order experience—that is, an experience that emerges out of first-order experiences.

Perceiving oneself as having an emotion is no different in kind from other perceptions. Percepts are often compelling, but they are not simple. Nor are they infallible. Like other acts of perception, an emotional experience is not entirely “bottom-up”, not entirely data driven. A percept is the end product of a complex process involving raw data, concepts, learning, and context. Smith and Neumann (2005) developed a sophisticated account along these lines by drawing on dual-process models of perception.

To perceive oneself as afraid is to categorise oneself by means of the concept of fear. It is to establish the meaning of one’s state via the concept of fear. In turn, the concept of fear can be unpacked as a script laying out a series of subevents (the components) in a temporal and causal order (Fehr & Russell, 1984). To perceive oneself as afraid is to see a resemblance between one’s current state and a mental script (the concept) for that emotion.

A separate hypothesis is that there are both similarities and differences in emotion concepts across cultures and languages (Russell, 1991; Wierzbicka, 1999). Although some of the raw data on which emotional experience depends are universal (core affect, somatosensory feedback, attributions, appraisals, etc.), where there are differences in emotion concepts, the corresponding emotional experiences would then vary as well. Evidence from a surprising source supports this prediction. In their effort to find a universal ANS signature for each basic emotion, Levenson, Ekman, Heider, and Friesen (1992) studied the Minankabau of West Sumatra. Participants were instructed to contract facial muscles into the prototypical configurations hypothesised for basic emotions. Doing so, in turn, alters ANS activity. For North Americans, this alteration of facial muscles and ANS activity resulted in reports of the experience of specific emotions. For the Minankabau, however, the same procedure failed to produce the emotional experience, presumably because their emotion concepts differed from those of North Americans.

*Appraisal.* On more traditional accounts, emotion is separated from thought and reason, as in theories in which emotion is encapsulated from cognition (Griffiths, 1997; Prinz, 2004). In other accounts, an appraisal is thought of as a part of the emotion or as an event that mediates between an antecedent event and the emotion. The dichotomy between rational thought and irrational emotion was long ago undermined by research showing, on the one hand, that cognitive processes emphasise economy and speed as much as rationality and, on the other, that cognitive processes are relevant to emotion.

Interestingly, appraisal was initially thought of as a simple evaluation (Arnold, 1960), but then more and more dimensions were added (Ellsworth & Scherer, 2003). Scherer's (this issue) latest theory draws on dual-process accounts to characterise appraisal as a complex, dynamic, multi-component process. To me, this suggests appraisal is involved not only in emotion but in the continuous monitoring of the environment by any sentient creature. We are constantly appraising the world around us, including perceiving the affective qualities of events, objects, and features. Doing so entails our full sensory-perceptual-cognitive apparatus, including rational thought. I therefore anticipate the addition of ever more dimensions as relevant. Rather than listing those cognitive processes involved in emotion, we might ask which sensory-perceptual-cognitive process is not involved. It might be the shorter list. For example, memoric processes are rarely mentioned, but emotional episodes can result from a situation via its association with a remembered event (Clore & Ortony, 2008; LeDoux, 1996). In the end, to account for the appraisal component of emotion may require nothing less than the full psychology of sensation, perception and cognition.

Appraisal has also been thought of as the principal source of individual differences in emotion: the reason the same antecedent can produce different emotions in different individuals. This enterprise will help underscore the great variety of individual differences within each category of emotion.

*Attribution.* Attribution, too, has typically been thought of as mediating between an antecedent and the emotion. A very common experience is feeling happy or unhappy about something. For example, one feels happy to hear from a friend, unhappy about the unexpected rain, and so on. My hypothesis is that these experiences require an attribution of core affect to the something, hearing from the friend, the unexpected rain, and so on. Attribution plays a greater role in emotional episodes than is sometimes appreciated. For example, Neumann (2000) placed participants in an ambiguous but upsetting situation. He used cognitive priming to influence attribution. Attribution, in turn, influenced subjects' self-reported emotion: attributing their upset to another person resulted in their reporting anger, whereas attributing their upset to themselves resulted in their reporting guilt. This study highlights subtle situational variation and individual attributional styles as a source of the variety of emotional episodes.

*Emotion regulation.* Emotion regulation is implicitly thought of as a consequence of the emotion, but I suggest that it be thought of as another, on-going process, much like I'm thinking of the other components of the emotion. I also suggest distinguishing two different processes. One is a fundamental motive in life and concerns core affect. We often (although not

always; Tamir, in press) behave so as to maximise pleasure and minimise displeasure—or at least take pleasure and displeasure into account. We also often behave so as to adjust our arousal level, sometimes raising it and sometimes lowering it. I refer to these two ubiquitous processes as *core affect regulation*. An account of this process will be had from a general account of behaviour, motives, goals, plans, and action. In a separate process, we seek to cultivate, avoid, or leave certain specific emotional states as defined within our given culture. Perceiving that I am afraid—or at least that others see me that way—I may put on a brave face. An account of this process requires an account of self-perception of emotion and of the role of folk concepts and cultural roles.

### Patterns among components

In the last section, I divided each token emotional episode into its manifest components, claiming that each component can be explained without positing an emotion as its cause. Indeed, all components (with the arguable exception of the experience of having the emotion) occur outside as well as inside emotional episodes and in such cases need to be explained without recourse to emotion. My list of components is not likely to be exhaustive, nor each explanation the final word, but my research agenda should be clear enough. One could, for the sake of argument, concede my point about the explanation of individual components, but still suppose that theorists need emotion concepts to explain the co-occurrence of the components within the emotional episode. That is, the concept of emotion not only specifies individual components but carries the assumption that various components recur in a highly coherent organised pattern. And of course, in science, a recurring pattern would require an explanation. So, how about patterns?

*Patterns are loose.* First, our traditional assumption about patterning must confront the accumulating empirical evidence. Correlations among the components appear on the evidence to be weak. Some of the entries in Table 1 point to empirical evidence that an anticipated association between two components is unexpectedly weak or nonexistent. Tradition anticipates that in cases of fear, one finds all or most of fear's components such as flight, the conscious experience of fear, a frightened face, an ANS signature unique to fear, and so on. This expectation has not stood up to empirical scrutiny (Lang, 1968, 1979, 1988; Lazarus, 1991; Mandler, Mandler, Kremen, & Sholiton, 1961; Rachman, 1984; Rachman & Hodgson, 1974). People who experience fear show a variety of ANS changes, engage in various behaviours, and so on. More recently, studies of the correlations among components of surprise and among those for disgust have been reported,

with similar results (Reisenzein, 2000, 2007). There is much less patterning to be accounted for than is traditionally assumed.

Many of the components are continuous psychological processes: core affect is always present; the ANS is continuously active; people are always behaving, always perceiving, always appraising, and so on. Because emotion's components are on-going processes, they necessarily occur in combination. The weakness of the correlations among components implies a large number of possible combinations. The question has not to my knowledge been raised which of these combinations constitute organised patterns and which mere combinations. For now, I won't pursue this distinction and will call all combinations patterns.

*Explaining the patterns that do exist.* Correlations found so far among components are weak, but not zero. Besides, patterns could exist that have not yet been established. Correlations that are found among components thus require explanation. Traditionally, theorists have sought a single central mechanism to account for what correlations exist—a fear-producing mechanism such as an affect programme, for example, to account for what associations occur among fear's components. A single central mechanism, however, is not warranted until simpler explanations are exhausted.

Some writers have recently acknowledged the growing evidence on the weakness of the correlations among emotion's manifest components and have begun exploring dynamic systems theory as a conceptual framework that accommodates the tremendous variation across situations and individuals within a given category of emotion (Camras, 2000; Colombetti, in press; Fogel et al., 1992; Lewis, 2000; Scherer, 2000). I believe a much simpler approach is possible, one that relies on already known sources of correlation. There are at least three, not mutually exclusive, alternatives.

First, features in the environment have a correlational structure. When two correlated environmental features each elicit a separate response, then those two responses will be correlated. For example, suppose that novel events are more likely than familiar events to block a goal. (Perhaps problems presented by familiar events have been previously encountered and solutions found.) Suppose further that goal blockage elicits an ANS pattern of cardiac acceleration and that novel events elicit frowns. If so, cardiac acceleration and frowning will be correlated even if no internal process links the two.

Second, one component process can influence another. For example, suppose that forming the face into a threat expression (the "anger face") alters breathing and muscle tension, which in turn alters ANS activity, perhaps cardiac acceleration. The consequence would be that the threat face is correlated with cardiac acceleration. The component of emotional experience uses the other components as raw data in the formation of the

percept. This hypothesis predicts that emotional experience is correlated with other components—more highly than they are with each other. Appraisal of current situation and attribution lead to emotional behaviour.

And, third, two components will be correlated when they are both influenced by a central mechanism other than emotion. For example, suppose that focused attention produces both muscle tension in the face and cardiac acceleration. If so, muscle tension in the face will be correlated with cardiac acceleration. The central mechanisms responsible for emotional behaviour (on Strack & Deutch's account, impulsive and reflective systems) influence other components such as facial and vocal behaviour and ANS activity.

In short, if my thesis pans out, the explanation for the pattern of manifest components that occurs in each instance of emotion is the explanation for the individual components plus well-known and simple explanations for the correlation among those components. No additional emotion-producing mechanism is needed. As an analogy, consider a fair game of poker. When cards are dealt fairly, each hand consists of a pattern of cards (a pair or straight, or whatever, although most patterns have no name within the rules of poker). Shuffling and dealing are the mechanisms that produce patterns; there is no additional pair-producing or straight-producing mechanism (other than cheating). Of course, in poker and in emotion, we see certain patterns, and doing so can be very important. Which brings us to the next topic.

## Perception of emotions

As outlined so far, psychological construction is a research agenda that hopes to explain each particular emotional episode by explaining its manifest components and the correlations among the components. To many readers, this programme, even if it were successful, would still leave something out. The available empirical evidence on correlations among components would not lead scientists to hypothesise fear or other types of emotion as their explanation. But then most of us do not hypothesise fear—we see it. We see discrete emotions in others and experience them in ourselves. We remember prototypical blue-ribbon cases of anger, fear, etc.—each with all the components in the right pattern. These compelling observations, experiences and memories of emotions do not entail the traditional view of emotions, but they do raise a question: How to account for these perceptions and memories? My account has two parts: the event perceived and the perceiver.

Consider the event perceived. Someone is going about his or her daily life, encountering various situations and pursuing various goals. He or she will necessarily be undergoing some of the components listed above, since they

are continuous on-going processes. Some component processes are therefore always present and always in some pattern. As plans unfold and situations occur, the components change and hence form new patterns. Therefore, even if the component processes were completely independent of one another, certain nameable patterns would form from time to time. That the components are somewhat correlated with each other means that certain patterns are more likely to form than others.

Now consider the perceiver observing this person. The perceiver does not simply register an external reality. Rather, the perceiver brings to the task a set of concepts embedded in a set of implicit assumptions and inherited from our linguistic ancestors—concepts for English speakers such as *emotion*, *fear*, *anger*, and so on. A concept such as *fear* is a mental script that specifies a temporal and causal pattern among various components. The perceiver observes the other's face, voice, behaviour, signs of physiological state, current situation, and so on. Perhaps the perceived person reports a subjective experience. The perceiver notes the similarity between the pattern of observed components and the script defining a category such as fear or anger. Occasionally, there is sufficient resemblance for that pattern to count as a member of the emotion category.

The key here is that membership in the emotion category does not require a set of necessary and sufficient features. Resemblance is a matter of degree. Occasionally, perceiving a single feature of the script will be enough for the instance to count as a member. Different observers may arrive at different categorisations of the same event. Although the script specifies a temporal and causal pattern, these aspects of the concept are not necessary either. Thus, uncoordinated combinations of components may still count as an instance of the category. The border between fear and not-fear is fuzzy.

The upshot is that members of the fear category resemble one another along different dimensions, and the set of all cases of fear is much more heterogeneous than most of our current scientific theories assume. This hypothesis is consistent with the general trend in the study of semantic categories. Traditionally, it was assumed that all the instances of a category must possess the same features, in this case the recurring pattern of defining components. Classically, the features were assumed individually necessary and collectively sufficient to determine membership in the category. Wittgenstein pointed out in his analysis of the concept of game that these assumptions are not necessarily so. We neither have nor need classical definitions. Analyses of the concepts of emotion, anger, and the like have similarly challenged the classical assumption (Fehr & Russell, 1984; Russell & Fehr, 1994). Further, memory is biased toward the more prototypical exemplars, which are first to spring to mind at mention of the category name.

Combining the nature of our mental categories for emotion with the ongoing nature of the component processes explains how we see emotions from time to time. In a person's life, at each instant, the processes called components are occurring. As the processes change, they necessarily form patterns. Many such patterns will seem random and go nameless, but sometimes the pattern will resemble the mental script for a specific emotion. Resemblance is a matter of degree, and so while some cases will be excellent examples of the concept, many will be mediocre examples, and some will be borderline such that one is not sure if it belongs inside or outside the category. The same event can resemble more than one script, albeit typically to different degrees. When resemblance is sufficient, we see the emotion in another or experience it in ourselves. We better remember the excellent examples, and excellent examples are more available when thinking about the category.

Even so, one might argue, events we categorise as, say, fear do in fact have some of the predicted components, and the blue-ribbon cases do in fact have all or most of the components and in the right order. All the instances named *fear* by an observer will indeed have some subset of the components specified in the mental script for fear. This fact follows trivially from the fact that all the cases were *selected* on the basis of their resemblance to the script. All the instances named as blue-ribbon examples of fear will have all or most of the components in the right order. This fact follows trivially from the fact that all the blue-ribbon cases were *selected* on the basis of their very close resemblance to the script.

What humans perceive, categorise, conceptualise and remember tells us less about the nature of reality than was traditionally supposed. As an analogy, consider the constellations we see in the sky. When we perceive the Big Dipper, we perceive real features: the stars comprising the Big Dipper are real and the pattern among the stars is real in the sense that the stars are really positioned in the universe such that they form a certain geometric pattern when viewed from earth. But stellar constellations, contrary to the beliefs held in many traditional cultures, are not interesting scientific entities. The Big Dipper does not explain the presence of the stars or the pattern among those stars. Constellations are not part of the causal story of astronomy. There is no use in asking for an astronomical account of why the Big Dipper exists or why it is structured the way it is. Astronomy long ago abandoned questions such as: What is a constellation? How many constellations are there? What are they? How were they generated? How does one constellation differ from another? What are their effects/functions?

## DEFENCE OF THE CURRENT PROPOSAL

Colombetti (in press) defended the existence of discrete emotion kinds as coherent and recurring packages (biological entities) by critiquing the account I have offered. She focused on the fact that humans perceive emotions in others. She argued that perception of an emotion entails the existence of components in the event so perceived. She wrote, “recognizing emotions is a matter of matching an acquired script with the features of a perceived event. . . . but we are able to [do so] because *there are* features in the episode that we identify as matching the script” (p. 20). She further argued that recognising an emotion also implies the existence of a pattern: my account does “not explain how categories (and/or mental scripts) can ever come to be applied to the various components that eventually make up an emotion episode. The problem, as I see it, is that it is impossible to provide such an explanation if one does not also posit that there are already coherent packages, or patterns, in the organism. It must be because there are already such packages that we are able to recognize and identify them by matching them with available categories and/or mental scripts” (p. 8).

Colombetti is surely right on two points. For any given token event, when an observer perceives another as, say, afraid, then normally (1) the other is showing one or more individual components of fear and (2) the components occur in a pattern. Nevertheless, it does not follow that the same component or the same pattern recurs in other cases called fear. What would be required to establish Colombetti’s claim is not just the existence of components in a pattern *in a given instance* but that the same components in the same pattern *recur in all or most instances of that emotion*. The assumption of a recurring pattern is widespread. It has been the assumption motivating a century of research seeking the features common to the instances of each kind of emotion.

So, it has been a great surprise when evidence has failed to support this assumption. For example, psychophysicists assumed that all or most instances of fear would show a similar ANS pattern, but no such recurring pattern has been found (Larsen et al., 2008). Many assumed that people reporting fear would show the same facial expression, but little evidence has been presented in support of this assumption, and some evidence suggests the opposite (Carroll & Russell, 1997; Fernandez-Dols & Ruiz-Belda, 1997; Fernandez-Dols, Sanchez, Carrera, & Ruiz-Belda, 1997). Similarly, many assumed that all or most instances of fear would have a behaviour in common. Yet, no such common behaviour has been found. Consider the spider phobic who jumps back from a spider, a mother afraid that her child is sick and rushes him to a hospital, the person sitting in a theatre watching a thriller, someone riding a roller coaster, and the person afraid of global warming (Russell, 2003).

One could of course argue that all the behaviours that occur in dangerous situations are “avoidance behaviours” or suppose the existence of an action tendency to avoid. Doing so, however, encounters three problems: First, there are counterexamples (thrill-seeking and bravery). Second, labelling a variety of different behaviours as “avoidance behaviours” adds nothing to their explanation, for the particular behaviour that actually occurs (jumping back from the spider, rushing to the hospital, etc.) remains to be explained. And, third, one cannot classify an isolated behavioural act as avoidance except in the context of an interpretation of the situation as dangerous. For example, to interpret running as fleeing rather than as approaching something else or as running for exercise requires knowledge of the context. Thus, the association between danger and a behaviour being avoidance borders on circularity.

Colombetti (personal communication, 28 August 2008) replied that, “These examples all support the view that there are common behaviors! Not across these examples, but within . . . there seem to be recurrent behaviors in specific contexts”. Commonsense supports Colombetti’s assumption, and many would assume she’s correct. But, her claim is an empirical one, and I predict that it will not be supported. Although not much evidence is available, what is available is not encouraging for her claim. The first context I mentioned, fear in phobias, has been studied. Indeed, this was the context that initially exposed the lack of consistent behaviour in fear (Lang, 1968, 1979, 1988; Lang et al., 1993; Rachman & Hodgson, 1974) and led Rachman (1984) to declare that “fear is not a lump”. In experimental tests, individuals are all subjected to an identical situation, and yet individual differences prevail. I predict that within each of the contexts that I listed—being afraid while having a sick child, watching a film, riding a roller coaster, and contemplating global warming—a variety of behaviours will be found.

The defensive behaviour of rodents in dangerous situations illustrates my view. Rats show a range of behaviours including active investigation of the threat stimulus, alarm vocalisations, escape, freezing, attack, avoidance, information seeking and risk assessment. Mother rats move pups to safer ground. As Blanchard, Hebert, and Blanchard (2007) summarised, “Defensive behaviours are modulated by features of both the threat stimulus and the situation in which it is presented” (p. 653). Perhaps a cage environment can be so constrained that all rats show the same behaviour, but maybe not. For example, two rats in a small empty cage typically leap into the air when the floor delivers mild electric shock, but occasionally they attack one another.

Finally, even if Colombetti’s claim were correct (behaviour is consistent within although not between situations), it would not justify postulating fear as an entity. In that case, the behaviour would be explained by the situation and not by fear. For the hypothesis of fear to have a scientific use requires

evidence of a similar pattern across the various contexts in which fear is said to occur.

## FUTURE DIRECTIONS

I have laid out an ambitious research agenda, which, needless to say, is subject to revision as data are gathered. I end with an even broader agenda. Core affect has been criticised because it does not capture all there is in emotion. My phrase “psychological construction” seems naturally to imply the psychological construction *of emotion*. I have been asked what evidence I can offer that core affect plays a central role *in emotion*, more central, for example, than appraisal or somatosensory feedback. Implicitly, the domain for our field is limited to emotion and the questions asked implicitly assume that emotions are what are to be explained. It is just such preconceptions that must be challenged. Admittedly, I presented psychological construction as a way of accounting for emotion. But doing so is meant to be a bridge between current concerns and a new approach. Psychological construction is an umbrella term for a host of mechanisms that explain not only those events called emotion, but a much larger set of events. Core affect is important in psychology; its role in those events called emotion is an empirical question and range from central to nonexistent in individual cases. Core affect extends beyond the domain of emotion.

When the general concept of emotion is treated as the folk concept that it is, without authority to determine scientific boundaries, then more real and important events become more visible and present themselves to be explained. Once the concept of emotion is relegated to a chapter title, with no real scientific work to do, then the domain of our inquiry is revealed to be much wider. Some of the events are what are now called emotions, some moods, some feelings, and many have no name. Blue-ribbon emotional episodes (those that fit scripts for specific emotions closely) are included, but have no special status. Borders between blue-ribbon cases, mediocre cases, borderline cases, and non-cases are fuzzy and serve no scientific purpose. Instead, let us be open to a wider range of events. Feeling good that the sun is shining or feeling bad that the weather is turning too warm may not qualify as emotions, but they are frequent events, influence other behaviours, and require explanation. More generally, even without emotion, anger, and the rest as scientific concepts, we are left with each of the components discussed here. The task is to explore each component and the relations among them.

The reader may find the analysis outlined here pessimistic. I find it optimistic. I believe that progress in the science of emotion has been blocked by unwarranted but hidden assumptions. On my suggested strategy, we will

have no grand theory of emotion, but we will have mini-theories of individual components. Research in practice already does just this. Freed from these roadblocks, progress may be rapid. Indeed, much has already been achieved, but not recognised because of these hidden assumptions. For example, consider the various theories of emotion proposed over the last century or so. Each theory has been found wanting, because it has been asked to perform an impossible task: account for all cases of emotion. Freed from this goal, these theories complement one another and point to important processes. Each may solve part of the puzzle. Cumulatively, they may together provide a viable account. The analysis of this article is aimed encouraging the development of separate accounts of each “component” of emotion and the empirical search for links and patterns among those components.

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