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# *Emotions Are Not Modules*[1]

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Jane is calmly strolling through the forest one lovely day. Suddenly, a large spider drops in front of her face. She immediately freezes; her heart races; her hands tremble; her face broadcasts "fear." She screams and runs away. Both before and after, she concedes that spiders in this forest are harmless.

Jane's reaction to the spider contrasts greatly with the way she normally reacts to events. Normally, or so the story goes, Jane weighs her options thoughtfully, choosing a course of action consistent with her beliefs and with the greatest benefit. Indeed, her reaction to the spider contrasts so greatly with calm, rational, deliberate, belief-consistent action that traditional folk psychology supposed two different kinds of mechanism are at work: animal-like emotion (located in the heart and gut) versus human reason (located in the mind). Her emotion explains her reaction to the spider. Her emotion made her do it.

This common-sense folk theory has grown into a plausible and productive scientific research program in which emotions (now relocated to a primitive part of the brain) are assumed to be fast-acting instinctual reflex-like responses honed through evolution to provide ready-made solutions to problems recurrent in our ancestors' day. I refer here to this research program as Basic Emotion Theory (BET).

BET implies that emotions are modular, meaning that they show many or all of the following features: unique output; fast; innate; subject to an evolutionary explanation; produced by a dedicated neural

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processor; mandatory (automatic and involuntary); and informationally encapsulated and hence beyond cognitive control (free from influence by certain seemingly relevant information).

This article briefly sketches my reasons for doubting BET. In doing so, I draw on an alternative account, one that poses the question of modularity in a different way. The key concept in my alternative account is Core Affect. I first characterize Core Affect and then turn to a brief critique of BET.

## I. Core Affect

Core Affect is a neurophysiological state accessible to consciousness as the simplest feelings: feeling good or bad, lethargic or energized (Russell 2003). When prolonged, these feelings are the basis of mood. Core Affect differs from specific emotions in a number of ways. A person is always in some state of Core Affect. Although Core Affect is involved in specific emotions, more typically Core Affect is a simple feeling. Core Affect is not necessarily directed at anything (it is non-intentional). Core Affect responds to too many simultaneous influences to mentally track its causes with certainty. As a consequence, although we sometimes have a good idea of why we feel the Core Affect we do, we often don't, as in free-floating moods. One influence on core affect is virtual reality (art, fantasy, music) as when a song makes us feel good or not so good.

Core Affect is an ingredient of (but not the whole of) specific emotions. Would we understand someone's grief without understanding (in addition to which facial expressions, changes in the Autonomic Nervous System, appraisals, actions, and so on occur) whether the griever feels good or bad? Would we understand joy without understanding whether the joyful person feels good or bad? (My claim is not that all cases picked out by English words such as *grief* or *joy* entail a *specific* value of Core Affect, but that Core Affect is an ingredient in our emotional lives. For example, a very atypical case of grief might include feeling numb rather than bad.)

## II. Evidence on Basic Emotion Theory

Reviewing evidence on BET is difficult because BET is a broad class of theories (or perhaps a framework or research program) that remains a





mix of folk and scientific psychology. There are different versions, even by the same theorist. These theorists differ in how (or whether) they define *emotion*, *anger*, *fear*, and other key terms. Theorists disagree on what makes an emotion basic, how to account for non-basic emotions, how many emotions are basic, the role of cognitive processes, and so on. They differ in whether emotion is explicitly a causal entity or not. I cannot here consider every version, but rather those basic assumptions that implicitly or explicitly underlie many of the versions. I therefore examine a stark generic prototypical version, depicted in Figure 1.

On the version of BET in Figure 1, an event triggers an "affect program" (Ekman 1972; Tomkins 1962, 1963), which is a specific neural pattern to be found in the lower regions of the brain. The affect program then triggers a coordinated set of manifestations (often also called components), consisting of a unique subjective experience, a pattern of activity in the Autonomic Nervous System, facial and vocal expression, and characteristic overt behaviour. Because on BET they stem from a common cause, these manifestations are assumed to be correlated in time and intensity. Figure 1 is a schema into which any one of the basic emotions can be substituted. If *anger program* is substituted for *affect program* in Figure 1, then it becomes a BET for anger. There is a specific small number of basic emotions. All the rest are subcategories, mixtures, or blends of the basic emotions.

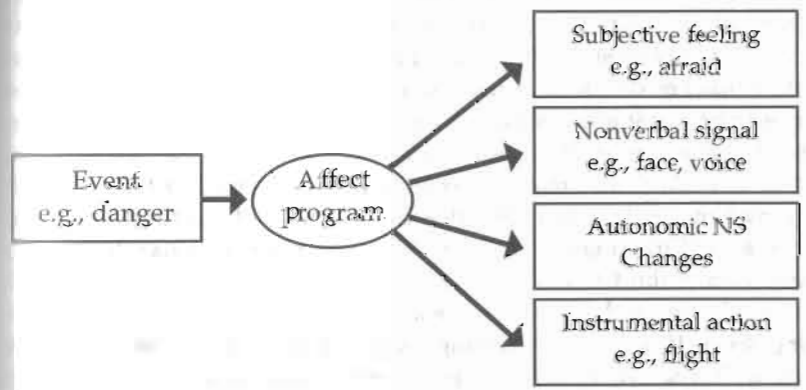


*Figure 1: A schematic version of a Basic Emotion Theory.*

BET implies various hypotheses about emotions, its components, and patterns among them. BET has generated a fair amount of evidence. I now discuss eight specific problems in a necessarily cursory way. Although BET is intuitively plausible, scientific evidence for it is surprisingly weak.

### *II.i. Facial Expression*

Figure 1 implies that emotions are expressed in the face. Indeed, the most celebrated evidence for BET allegedly shows universal facial expressions for the basic emotions (Ekman 1972). Much of this evidence concerns *recognition*. That is, the evidence bears on the claim that, whatever their cultural heritage, observers agree among themselves in attributing the same emotion to certain facial expressions. Scrutiny of the primary (rather than secondary) sources reveals many problems with this evidence (Russell 1994). These studies typically relied on methods with a series of features that likely artificially inflated the amount of agreement: posed exaggerated expressions, highly pre-selected expressions, and all observers seeing all the expressions within the context of deciding which one from a short list of emotions to associate with each face. For example, substituting spontaneous for posed expressions substantially reduces the amount of agreement among observers. Similar reductions occur when other features of method are altered. With aboriginal societies, the studies likely also included experimental demand. Even if each such method factor alone exerted only a modest effect; together, these problems may cumulatively account for much of the agreement. It is not clear, especially for non-Western groups, whether agreement among observers would be much greater than chance if all method factors that exaggerate the amount of agreement were replaced with more neutral ones. People universally make reasonable interpretations of facial expressions, but it is far from clear that they universally attribute the same emotion to the predicted expressions. It is not even clear that people universally think of emotions in the same terms.

Evidence on the "universal recognition" hypothesis is unconvincing. Even if it were convincing, evidence on recognition would not show that having an emotion *produces* facial expressions. Surprisingly little evidence is available on this issue. Of course, human beings





(young and old, sighted and blind, etc.) move their facial muscles. The question is the relationship of these movements to emotion. What little evidence exists on this question is not encouraging. For example, Camras (1992) examined one child for over a year and failed to find the predicted facial expressions in specific emotional circumstances. Fernandez-Dols and Ruiz-Belda (1995) found that persons in a clearly ecstatic state (having just won a gold medal at the Olympic Games) failed to smile except in specific social circumstances. When people in a certain emotional state do produce a facial expression, it may not be the full pattern presented in BET but a part of that pattern or a different pattern (Carroll and Russell 1997).

Proponents of BET can counter by pointing to non-emotional influences on facial movements. Consider one such influence: "display rules" – a notion that Ekman (1972) borrowed from Klineberg (1940). A display rule is a culture-specific norm dictating when the natural expression is allowed or is to be altered (inhibited, masked, or exaggerated). Display rules are problematic as a lifeline for BET for two reasons. First, it is not clear just how display rules account for the current evidence on production. Display rules are implausible with the young child studied by Camras or in the culturally heterogeneous group studied by Fernandez-Dols and Ruiz-Belda. Second, invoking display rules *ad hoc* whenever the BET-predicted facial expression fails to occur renders the BET account of faces non-falsifiable in the absence of a more detailed and predictive theory of display rules than we now have.

In addition, even when a part or whole of a BET-predicted facial expression does occur in the expected emotional circumstances, there are alternative explanations for that occurrence. Faces move as part of pretty much everything we do. Faces move as we speak, listen, attend, look away, shout, etc. We wrinkle our noses while smelling; we raise our brows while looking up. Faces change with the general arousal and positive versus negative quality of Core Affect (Lang et al. 1993). Specific facial signals may exist that evolved to guide social interactions, such as threat, greeting, and submission (Fridlund 1994). Fridlund pointed out that evolution is unlikely to have produced automatic veridical signals of emotional state (which would be indiscriminant altruism) but could have produced (and in many species did produce) signals that influence another's behaviour to the signaler's advantage. Thus, signaling one's fear would be non-adaptive in

a hostile encounter (just as veridical signaling would be non-adaptive in poker), but a threat face could be useful. From all this information from the face, an observer can make a good guess about the expresser's situation, intention, and so on – including emotion. (This process may explain what agreement there is among observers on the emotion "expressed" by a given face.)

### *II.ii. Patterns in the Autonomic Nervous System*

Studies by Ekman et al. (1983) found that three clusters of emotion could be differentiated by activity in the autonomic nervous system (ANS, which controls such peripheral activities as blood pressure and sweating). This finding suggested that each basic emotion would leave an identifiable fingerprint in the ANS, but no study has found them. But even if a study had done so, a methodological issue would then arise: In any one study, each specific emotion is confounded with various co-occurring events. Between, say, an anger and a fear condition in such a study, much is different: different eliciting circumstances, different memories, different thoughts, and so on. The ANS fingerprint should be common to various instances of the emotion, however elicited. The key question is therefore whether the same ANS fingerprint for each emotion emerges *across* different studies (i.e., across different ways of creating the emotion, different memories, and so on). What is required is a meta-analysis, which is a statistical method for finding consistencies across studies. Meta-analyses examining this question (Cacioppo et al. 2000; Zajonc and McIntosh 1992) showed little evidence of such fingerprints for individual emotions or for the clusters of Ekman et al. (1983).

Of course, the ANS changes as one's circumstances change. But the explanation for those changes need not involve emotion concepts. ANS activity is ongoing, with both general features and specific chores to do. The ANS is influenced by Core Affect (Lang 1995; Lang et al. 1990). It is influenced by whether the eliciting situation is perceived as a threat or a challenging opportunity (Tomaka et al. 1997) or whether one is preparing to approach or avoid (Cacioppo et al. 2000; Lang et al. 1993). Tellingly, different ANS activity occurs for the same emotion elicited differently (Hamm et al. 1992) or with different behavioral implications (Hamm et al. 2003).





### *II.iii. Overt Behaviour*

In folk psychology, flight is explained by fear, fight by anger. And human raters can reliably associate specific emotions with specific actions (Frijda and Tcherkasoff 1997). However, BET theorists have abandoned the claim that fear entails flight, anger entails fight, or other specific emotions entail other specific instrumental behaviours. Counter-examples are clear: fear without flight, anger without fight, and so on. Actual instrumental behaviour is not triggered automatically. Instead, behaviour is guided by the specific situation. Encountering the spider, Jane might simply flee; but afraid of a car accident, she might put on the brakes; afraid of a disease, she might telephone her doctor; afraid that her child is in danger, she might run toward the child. Animals can be constrained in cages such that freezing or flight is the only available response to a sign of danger, but given fewer constraints, monkeys explore the danger (MacDonald and Pinel 1991) and mother rats pick up their pups and move them to safety (Pinel and Mana 1989). Given such observations, BET's claim now is that emotions produce action *tendencies* (Frijda 1986). Still, Frijda's list of action tendencies does not match one-to-one his list of basic emotions. The move from action to action tendencies leaves actual action unexplained.

People do sometimes fight or flee or otherwise behave emotionally. It is unclear how BET contributes to an explanation of that behaviour, which can instead be explained in other ways. There are reflexes: startle, orienting, blinking, gag, etc, but these reflexes are more specific than emotions. Some behaviour is stimulus- and hormone-bound (Numan 2006), but again more specific than emotions. A person is usually engaged in pursuit of a hierarchy of goals through execution of plans. Goals and plans may be activated automatically (Bargh 1997). Emergencies arise, which call for hasty planning and quick execution of the plan. Even hasty instrumental behaviour is complexly determined and sensitive to situational demands (Bouton 2005). Fleeing a danger is a hastily constructed and executed plan.

### *II.iv. Subjective Feeling*

People sometimes consciously *feel* angry, or afraid, and so on. BET accounts for such experiences through the assumption that each basic emotion entails a specific primitive subjective conscious experience.

the "feeling of" that emotion – much as the detection of light of a certain wavelength entails a unique primitive subjective conscious experience of red. The subjective feeling of an emotion has sometimes been called a "readout" or even "essence" of that emotion. Such terms suggest that the feeling is a veridical detection of the emotion. On BET, the number of such universal primitive emotional feelings equals the number of basic emotions.

Available evidence, however, does not support this account. Consider how emotions are categorized in different languages (Russell 1991; Wierzbicka 1999). One might think that if emotional feelings come in a small number of universal basic primitives, then all languages might lexicalize them; this is not the case. Or, even if not all are lexicalized, what words for emotions do exist in the world's languages would correspond to BET's basic emotions; this is not the case. Linguistic categories into which emotions are divided do not correspond one-to-one across languages.

Consider as well factor analytic studies of self-reported emotional experience. Factor analysis is a statistical technique designed to uncover the separate causal "factors" of the reported feelings. Such studies have not found factors of anger, fear, sadness, and so on, but instead found broader dimensions such as positive vs. negative and degree of arousal (Feldman Barrett and Russell 1999; Watson and Tellegen 1985). (This research led to the hypothesis of Core Affect.)

Of course, people do sometimes feel angry, sad, and so on. For many, acceptance of BET stems mainly from this simple fact. Such conscious feelings surely occur, but we need not accept BET's assumption of a small number of simple universal primitives. On my alternative account, such experiences are perceptions, no different in kind from other perceptions. Percepts are often compelling but they are not simple or primitive. They are rich complex end-products of processes involving concepts, learning, and context. They can be mistaken. They are not necessary for the occurrence of other components. There is an uncountable number of such percepts, family resemblance categories of which can be found. One prediction therefore is that these experiences vary to some degree with culture. Let me cite just one piece of evidence obtained in a study by Levenson et al. (1992). In their effort to find a universal ANS fingerprint for each basic emotion, they studied the Minankabau of West Sumatra. Participants were instructed to





contract facial muscles into the prototypical configurations hypothesized for basic emotions. Doing so, in turn, alters ANS activity. For North Americans, this combination of facial muscle contractions and ANS activity resulted in some reports of the experience of the targeted emotion. For the Minankabau, however, the same procedure failed to produce the emotional experience.

### *II.v. Neuroscience of Affect Programs*

Every psychological state or event is produced by the brain; different psychological states therefore imply different patterns of brain activity. This truism must be presupposed in any account of emotional episodes. BET provides the additional hypothesis of a unique pattern for all cases of each basic emotion.

Consistent with BET, research with non-human animals led Panksepp (1998) to postulate a discrete circuit for each basic emotion. However, Panksepp's list of basic circuits (seeking, fear, rage, lust, care, panic, and play) does not correspond to Ekman's (1972) list of basic emotions (happiness, surprise, fear, anger, disgust, and sadness). Panksepp circuits might best be thought of as mechanisms of basic mammalian behaviour, which may or may not be recruited in any given emotional episode. Despite its name, the "rage circuit" would not be unique to anger. The rage circuit might be recruited for aggressive behaviour in some cases of anger, but not others (anger over the injustice of war). The same circuit might also be recruited in some cases of fear (Jane might swat the spider in defensive aggression), joy (triumphant dominance over others), fun (rough-and-tumble play), or excitement (competitive sport).

With humans, neuroimaging has been used to search for neural correlates of discrete emotions. Such studies are subject to a methodological issue similar to the one described earlier in regard to an ANS fingerprint for each emotion. Two events that are different psychologically must be different neurally. *Within* any given study, different emotions (each with a different eliciting event, different memories, and so on) will therefore be associated with different patterns of brain activation, but the key question is whether the brain activation pattern for a given emotion remains constant *across* different studies (i.e., across different ways of eliciting the emotion, different types of accompa-

nying memories, etc.). Two recent meta-analyses found only modest consistency across studies (Murphy et al. 2003; Phan et al. 2002). The two analyses did not agree with each other on the most likely brain pattern for some emotions. Further, no brain pattern has been found unique to a given emotion.

### *II.vi. Encapsulation*

Basic emotions are said to be encapsulated from general cognition (Griffiths 1997). That Jane was afraid of a spider she knows to be harmless illustrates the idea. Many people have experienced fear watching a film, even though they know that no real danger exists. Prinz (2004) gave as another example sadness resulting from the experience of art (reading a novel, listening to music, or even hearing a D minor chord); in each case, the sad person knows that no real loss has occurred but feels sad nonetheless.

BET does not generally include encapsulation and, indeed, theorists typically endorse a contrary view: that emotions are determined by (or include) cognitive appraisal processes (Frijda 1986; Lazarus 1991; Ortony et al. 1987; Roseman 1991). More generally, in the examples cited, some perception and cognition are involved (Jane *saw* the spider; people must *see* and *understand* the film or *hear* the music.). So, the first question is what precisely is encapsulated from what. The idea that basic emotions are encapsulated from general cognitive information has not been translated into a scientifically testable hypothesis.

Equally important, support for encapsulation is largely limited to anecdotes such as those I cited. The next question is therefore whether the anecdotes are real and reliable. If real and reliable, then the question is this: to which classes of event can the cases of encapsulation be generalized? After all, people's beliefs, desires, and actions are sometimes inconsistent with one another. Therefore the real cases would need to be examined carefully to show that it is emotion, rather than something else, that is encapsulated.

To illustrate, return to Jane and the spider. The story I told is fiction, but readers find it believable because it is consistent with our folk theory, and, of course, people do get frightened by spiders. So, such events would have to be examined to find out what precisely occurs. We need to know whether the entire BET fear reaction occurs,





or if what is encapsulated is, for instance, simply the startle reflex. Or return to the anecdotes of emotion in response to art. Core Affect responds to the contents of consciousness irrespective of one's knowledge of whether the contents are real or fiction. Core Affect responds to virtual reality. A horror film may create a Core Affect of upset, rather than the full-blown BET emotion of fear: people do not flee the theatre; indeed, they pay to attend. Similarly, the sadness from reading a novel, listening to music, or hearing a D minor chord may be limited to Core Affect. So, cases of encapsulation do not necessarily entail BET. It might be that what is encapsulated and beyond certain kinds of cognitive control is a reflex, Core Affect, or something else.

### *II.vii. Scope of Basic Emotion Theory*

BET is a theory of emotion. This broad but vague scope is problematic. Many important emotions – love (of a romantic partner, of offspring, of humanity), hate, envy, jealousy, depression, anxiety, sympathy, empathy, regret, hope – have not been satisfactorily accounted for by BET. The term *emotion* is limited to a small number of languages (Russell 1991) and is ill-defined (Fehr and Russell 1984). I see no reason to believe that *emotion* is a homogeneous class and there is reason to suspect the opposite (Griffiths 1997). Such features make emotion a problematic concept as a scientific tool (although as a concept, *emotion* remains an object of scientific study). For example, it is unclear in investigating BET which events provide a test for BET and which are outside its scope.

The same problem arises with the subcategories of emotion clearly within the scope of BET: anger, disgust, fear, happiness, surprise, and sadness. These categories appear not to be homogeneous classes (Russell and Fehr 1994). Humans tend to think in terms of anecdotes and prototypical exemplars, but we must not assume that what is true of one member of a category is true of other members of that category, especially for everyday folk categories. Even if some examples of anger (flash of anger at being punched), disgust (at rotten food), or fear (of a looming spider) show a property such as speed or encapsulation, it does not follow that the same is true of other examples of anger (long-held indignation at an injustice), disgust (at taboo violations), or fear (of developing cancer).

*II.viii. Coherence and the Existence of Patterns*

Suppose for the sake of argument that the alternative explanations I've mentioned so far for each separate component are plausible such that no one component entails BET. One might still argue that basic emotions are implied by the patterns among those components. The single most important prediction of BET therefore is this: the manifestations/components (the right column in Figure 1) of an emotion are highly correlated with each other in time and intensity. This prediction follows from the model of Figure 1 because all manifestations stem from a single cause. But this prediction also follows from the definition of a basic emotion as a pattern of components.

Research has repeatedly uncovered surprisingly weak correlations among these manifestations (Lang 1968, 1995; Mandler et al. 1961; Rachman and Hodgson 1974). In the most sophisticated set of laboratory studies on this topic, Reisenzein (2000) examined the intercorrelations among four components of surprise: cognitive appraisal, self-reported experience of surprise, reaction time, and facial expression. Correlations were modest, with the exception of one relation that is close to a tautology: a correlation between self-reported feeling of surprise and self-reported appraisal of the stimulus as unexpected.

A single central mechanism (the affect program) is not the only possible explanation of what correlations do exist. There are three alternatives. First, environmental features can be correlated. If two correlated environmental features each elicit a separate response, then those two responses will be correlated – even if there is no internal link between the two responses. To illustrate, suppose that friends tend to be more predictable in their behaviour than are strangers. Suppose further that friends elicit smiles of greeting and that predictability elicits an ANS pattern of cardiac deceleration. If so, smiling and cardiac deceleration will be correlated. There need be no internal common cause or internal link between smiles and cardiac response.

Second, one component process can influence another. For example, suppose that forming the face into an intense expression (such as the "anger face" or "threat 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.





And, third, two components will be correlated when they are both influenced by a central mechanism other than emotion. For example, suppose that a person makes the calculated decision to be friendly to a stranger. This decision leads to both smiling and behavioural approach.

In short, the existence of patterns of weakly correlated components does not imply that these patterns stem from an affect program or any other single source. Proponents of BET might reply that patterns among the components do occur nonetheless, and I agree. The question is the nature of these patterns, how to define them, how they come about, how frequently they occur, and whether they naturally divide into a small number of universal categories.

Here is an alternative way to think about patterns. Each of the many component processes that make up the emotion pattern is ongoing. The ANS is always in some state; facial muscles often move; people are always behaving; and so on. The component processes therefore always form some pattern. As the processes change, new patterns form. Most such patterns are uninteresting and have no name. Even if the processes were completely independent of one another, interesting and nameable patterns would occasionally form by the laws of chance. Most poker hands are uninteresting and have no name, but even when cards are dealt randomly in a fair game, interesting and nameable hands (such as a royal flush) arise from time to time. To the extent that the component emotion processes are somewhat correlated with each other, certain patterns are that much more likely to form. The occasional formation of an interesting and nameable pattern of emotion components, or of cards in poker, does not imply that these patterns are anything more than happenstance.

My alternative proposal is not actually happenstance, but this: an uncountable number of patterns occur because the components change in response to circumstances. Each such token event (each specific combination of components occurring in a specific person, time, and place) is psychologically constructed to suit the immediate circumstances. The events are constructed on the fly rather than preformed. If so, one might ask, how is it that we perceive a small rather than uncountable number of emotions?

*II.ix. Perception of Emotion*

The lack of evidence for BET is surprising because BET seems obviously true. Emotion is not ordinarily thought of as a hypothesis, but as something we see. We witness events such as Jane's fear of the spider and we experience fear ourselves. BET is implicit in the words – *emotion, fear, anger*, and so on – that we use to ask questions and formulate answers. These observations and experiences of emotions do not, however, entail BET. Instead, they are further events that require explanation.

In observing other persons or ourselves, we bring to the task a set of concepts inherited from our linguistic ancestors – for English speakers, these are concepts such as *emotion, fear, anger*, and so on. These everyday concepts lack necessary and sufficient features but entail heterogeneous clusters with fuzzy borders. Members of the category resemble one another along different dimensions. A concept such as *fear* is a prototypical script that specifies a temporal and causal pattern among its various components, but exemplars of the concept need not fit the script exactly.

A person witnesses a pattern of components in another or in him- or herself. Many such patterns will seem random and go nameless, but sometimes the pattern will resemble the script/concept for a specific emotion. Resemblance is a matter of degree, and so while some cases will be excellent examples of the script/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. Such sightings and experiences are not veridical detections but after-the-fact labelings.

*II.x. Interim Conclusion and Retrenchment*

As a research program, BET is faring poorly. Perhaps the version portrayed in Figure 1 can be accused of being a straw man. Perhaps the same complaint would be made of any explicit version of it. Because there are many possible versions of BET, no one problem found with it is lethal. Thus, the evidence does not rule out BET. New revised versions can always be created.





For example, faced with failure to find an ANS fingerprint for each basic emotion, one could propose that emotion-specific ANS fingerprints exist but are hidden by measurement difficulties or by the demands of simultaneously occurring behaviour. Or the ANS fingerprints could be moved to their origin in the brain with only shadows seen in the periphery. Or the ANS component could be abandoned altogether, leaving the rest of BET intact. Similarly, one could abandon the idea of a central organizing mechanism (the affect program in the centre of Figure 1) and simply think of emotion as a pattern directly produced by the stimulus.

A major conceptual retrenchment is also possible. BET's scope could be limited to a few basic emotions, anger, fear, and a few more (Griffiths 1997). And, for scientific purposes, anger, fear, etc, could themselves be re-defined. No such re-definitions for BET's central concepts have been developed, but suppose that with re-definition all cases of *anger, disgust*, and *fear* and other hypothesized basic emotions necessarily have certain of the properties listed in Figure 1. It is not clear what proportion of cases of what is now called *fear* or *anger* and so on would have to be excluded. Depending on the definition, many, most, or even nearly all cases might have been excluded. Given the surprising heterogeneity within the current categories of anger, etc., re-defined limited homogeneous categories would be very different from what we have today. Further, even with re-definition, it remains a scientific question whether BET provides the best account of these limited cases. A more general question is whether the reconceptualized BET has much to say about human emotional life.

## III. Modularity Revisited

The concept of Core Affect opens up an alternative perspective on our emotional lives, of which blue ribbon emotions of BET are but a tiny part. This perspective has many implications, but I limit myself here to its implications for modularity. The heterogeneity and highly variable nature of the basic emotion categories of BET do not support modularity of those categories. On my alternative, the question of modularity is asked not of the pattern/emotion category but of each component process separately. Questions about instrumental behaviour, facial behaviour, the autonomic nervous system, and so on can

be referred to the appropriate branch of psychology. Each component may or may not be modular. After farming out these questions, we are left with but one process: Core Affect.

Core Affect too may or may not be modular. It does have certain modular-like features: unique output, fast, an evolutionary explanation, and so on, although encapsulation merits some discussion. Some examples of Core Affect strongly suggest information encapsulation. 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. We often experience feelings for which we have no name or explanation. Encapsulation is also suggested by Core Affect's responses to virtual reality in art, memory, fantasy, imagination, and so on. Knowledge that the circumstances are not "real" does not diminish the Core Affect.

On the other hand, cognitively processed information can be a powerful influence on Core Affect: 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 require cognition. These examples also have another feature in common: conscious attention to the information. Let me speculate that general cognitive appraisals per se do not alter Core Affect (or not much) unless we are conscious of them. Consider the excitement of winning the lottery. If the news continues to invade consciousness (obsessive thoughts, reminders), then it continues to shape Core Affect. But if one is distracted and thoughts about the win are pushed out of consciousness, then the excitement fades. On this speculation, Core Affect is encapsulated from general information, with the major exception of information – real or fictive – seen through the window of consciousness.

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