CHAPTER 4

The Conceptual Act Theory

A Roadmap

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Over many centuries, philosophers and psychologists have assumed that the mind is structured as a typology, containing Platonic emotional types such as anger, sadness, fear, and so forth. Emotions are presumed to be basic elements (i.e., biologically and psychologically primitive). Scientists have searched for the corresponding physical essences for these emotion types in patterns of peripheral nervous system response, in facial muscle movements, and in the structure or function of the mammalian brain, attempting to identify the "natural joints" that distinguish different one emotion type from another. This approach, aptly termed the *natural kind* approach (Barrett, 2006a), has its roots in the 17th-century mental philosophy of *faculty psychology* (e.g., see works by Wolff as discussed in Klein, 1970; works by Gall and Spurzheim discussed by Harrington, 1987; cf. Lindquist & Barrett, 2012). When viewed as mental faculties, emotions are considered to be adaptations in the teleological sense (as natural processes that evolved to serve a specific end goal).

Faculty psychology has not been without its critics over the centuries, and criticisms have laid the groundwork for an alternative approach to understanding the mind's structure, termed *psychological construction*, or sometimes just *construction*. In this chapter, we present an overview of our psychological construction model of emotion, named the conceptual act model, and later, the conceptual act theory. The conceptual act theory of

1. *If emotions are psychological events constructed from more basic ingredients, then what are the key ingredients from which emotions are constructed? Are they specific to emotion or are they general ingredients of the mind? Which, if any, are specific to humans?*

The key ingredients for emotion are not specific to emotion but are domain-general ingredients from which experiences emerge more generally. The nature of the ingredients will vary, depending on whether they are specified at the psychological or biological level. The conceptual act theory was first formulated at the psychological level, specifying ingredients as psychological processes, such as sensory processing, including interoception, category knowledge, language, executive function, and so on. We then moved to a more brain-based epistemological approach, attempting to specify the processes within the body and the brain from which emotions emerge. At this moment in time, for example, intrinsic networks within the human brain are good candidates for the functional architecture from which emotions emerge. We are not proposing a strict one-to-one correspondence between the psychological ingredients that have been proposed in constructionist theories and these brain networks. However, the network functions must be described in psychological terms (otherwise we do not have a model of how the brain creates the mind—we just have a model of how neurons fire). The bottom line is that we employ the general strategy of taking a brain-based approach to discovering the ingredients of emotion, and to describing them in psychological terms, although the specifics of what the ingredients are will likely change as more is learned about how the brain functions.

Taking a brain-based approach to discovering ingredients allows for more specific evolutionary hypotheses about the construction of emotion, as well as speculations about which ingredients are species-general and which are species-specific. For example, many intrinsic brain networks can be found in other mammals, although several show human-specific adaptation (e.g., the default mode/mentalizing network, the language network) and several exist in other great apes but not in monkeys (e.g., the frontoparietal control network and the salience network; Mantini, Corbetta, Romani, Orban, & Vanduffel, 2013). As a consequence, humans (and perhaps in a more limited way, great apes) have the capacity to symbolically represent sensory changes as emotion, and to be sufficiently aware of these products of construction to use them more deliberately in the service of behavioral regulation. Some humans can even become aware of the process of construction itself (e.g., via meditation), thereby having flexibility about when (and when not) to construct an emotion in the first place.

2. *What brings these ingredients together in the construction of an emotion? Which combinations are emotions and which are not (and how do we know)?*

Because the brain is a large, interconnected neural net, individual neurons, circuits, and networks do not function in insolation and independently of one another, like the bits and pieces of a machine. Instead, there is continual and

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spontaneous neural activation, coordinating over time (in a normal functioning brain); incoming sensory input modulates this activity, as do modulatory networks such as the frontopartietal control network. As a consequence, nothing "brings the ingredients together"; as neurons fire, they influence and constrain each other as a normal part of how the brain functions. The networks might work together via constraint-satisfaction logic (Barrett, Ochsner, & Gross, 2007; Cunningham et al., Chapter 7, this volume). Nothing biological distinguishes an emotion from a non-emotion (i.e., there are no networks that are specific for emotion). Emotion-cognition-perception distinctions are phenomenological and are not respected by the brain.

3. *How important is variability (across instances within an emotion category, and in the categories that exist across cultures)? Is this variance epiphenomenal or a thing to be explained? To the extent that it makes sense, it would be desirable to address issues such as universality and evolution.*

Variation is a key feature that must be explained in any theory of emotion. From an evolutionary standpoint, variation is the key to survival. In the conceptual act theory, an emotion word refers to a conceptual category that is populated with variable instances. So our theory, like most psychological construction theories, takes variation seriously as part of the phenomenon to be explained. We hypothesize that emotions are constructed as tools for helping humans get along and get ahead as they live in social groups; to the extent that emotion concepts solve similar problems across cultures, they will be similar across cultures (cf. Barrett, 2006b, 2012).

4. *What constitutes strong evidence to support a psychological construction to emotion? Point to or summarize empirical evidence that supports your model or outline what a key experiment would look like. What would falsify your model?*

The conceptual act theory would be falsified if it were shown that conceptual knowledge is not required for an emotional episode to emerge or for emotion perception to proceed. Studies that purportedly find such evidence (e.g., congentially blind athletes showing critical components of pride expressions) do not falsify the conceptual act theory unless it can be shown that results cannot stem from conceptual processing (e.g., representations of color are similar in congentially blind, color-blind, and normally sighted individuals, implying that some kind of conceptual knowledge is involved; Shepard & Cooper, 1992).

For many years, it was believed that any evidence for the biological distinctiveness of emotions was evidence for a "basic emotion" view and against a "constructionist" view. But evidence of biological distinctiveness between instances of two different emotion categories does not necesarily falsify the conceptual act theory per se (see Barrett, Chapter 3, this volume). In fact, the conceptual act theory makes very specific predictions about how, at the biological level of analysis, instances of the same emotion category might be different, and how instances of different emotion categories might be similar.

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The strongest evidence supporting the conceptual act theory comes from neuroscience studies showing that the same domain-general brain networks configure differently in different varieties of the same emotion category, in instances of other emotion categories, and even in non-emotional instances (of memory, perception, social cognition, etc.). That being said, the science of emotion has been too prescriptive (stipulating what emotions are) in the absence of careful observation. Careful observational work is needed to document the variety of instances, including their contexts, for each emotion category within a given culture. Only then can we discover (rather than prescribe) any regularities in the phenomena to be explained.

emotion was introduced in 2006 and has been elaborated through a series of theoretical and empirical articles (Barrett, 2006b, 2009a, 2009b, 2011, 2012, 2013; Barrett & Bar, 2009; Barrett & Bliss-Moreau, 2009; Barrett, Lindquist, & Gendron, 2007; Barrett, Mesquita, Ochsner, & Gross, 2007; Barrett, Ochsner, & Gross, 2007; Barrett & Satpute, 2013; Barrett, Wilson-Mendenhall, & Barsalou, 2014; Duncan & Barrett, 2007; Lindquist & Barrett, 2008, 2012; Lindquist, Wager, Kober, Bliss-Moreau, & Barrett, 2012; Wilson-Mendenhall, Barrett, Simmons, & Barsalou, 2011). In this chapter, we present a summary of the main ideas within these articles.

To introduce the conceptual act theory, we first discuss the hypothesis that mental states emerge as the consequence of an ongoing, continually modified constructive process during which stored knowledge within an experiencer (as reactivation and recombination of prior experience, referred to as "top-down" influence) makes incoming sensory inputs meaningful as *situated conceptualizations*. This discussion sets the stage for an overview of four major hypotheses of the conceptual act theory.

First, emotion words (like words for all mental states) are not assumed to be Platonic, physical types but are instead hypothesized to be abstract categories populated with variable instances (Hypothesis 1: Variability). Variability is created when physical responses (e.g., from behavioral adaptations) are optimized for a particular situation or context because sensory inputs (from the body and the world) are made meaningful using highly context-dependent and culturally dependent conceptual information about emotion derived from past learning or experience.

Second, the brain's architecture can be thought of as a situated conceptualization generator producing the individual brain states that correspond to each individual instance of an emotion (Hypothesis 2: Core Systems). Each category of conceptualized instances does not share an essence but instead arises from the interaction of core systems within the brain's architecture that are domain-general (which means that the systems are not specific to the traditional domains of emotion, cognition, or perception). These core systems can be characterized both at the psychological level and at the level of brain networks.

Third, instead of redefining (or reducing) mental phenomena into these core systems, the goal of the conceptual act theory is to analyze how mental states emerge from their interaction (Hypothesis 3: Constructive Analysis).

Fourth, from this viewpoint, emotions exist as conceptualized instances of sensation based on functional (rather than teleological) considerations (Hypothesis 4: Social Ontology). The idea is that conceptual knowledge is embodied and enactive, producing novel features during an instance of emotion via inference, such that emotional episodes take on functions that the physical sensations do not have on their own during the trajectory of a situated conceptualization. At the chapter's conclusion, we briefly consider how the conceptual act theory provides a unified framework for studying emotional experience, emotion perception, and emotion regulation, and more generally provides a novel approach to the functional architecture of the human brain.

Conceptual Knowledge Combines with Sensory Inputs to Construct Human Experiences

Take a look at Figure 4.1. Most of you, right now, are in a state called "experiential blindness" (e.g., Fine et al., 2003). You are taking in visual input, but your brain cannot make sense of it, so you do not see an object—you see black and white blobs. Normally, in the blink of an eye, your brain is able to integrate this sensory stimulation seamlessly with its vast amount of stored knowledge (from prior experience, referred to as "top-down" contributions), allowing you to construct a visual experience of the object. In fact, it is well accepted, now, that this is how normal vision works (Gilbert

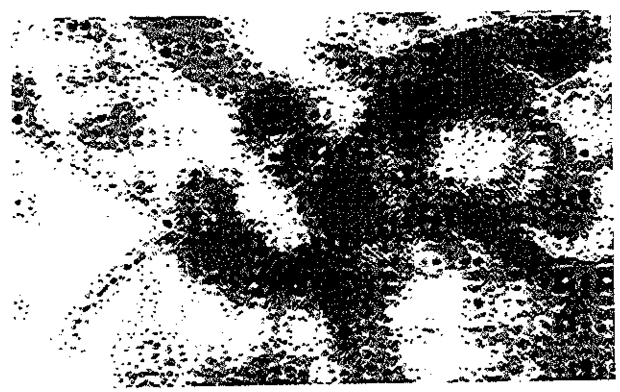

FIGURE 4.1. An illustration of experiential blindness. From Barrett, Wilson-Mendenhall, and Barsalou (2014). Copyright 2014 by The Guilford Press. Reprinted by permission.

& Li, 2013). This occurs via the process of predictive coding (Adams, Shipp, & Friston, 2013; Bastos et al., 2012; Clark, 2013; Friston, 2002; Hohwy, 2013; Shipp, Adams, & Friston, 2013). Your brain continually generates hypotheses based on past experience in a top-down fashion and tests them against incoming data. Such knowledge is not merely helpful—it is necessary to normal perception. With this knowledge, you normally categorize incoming information to construct a visual representation of the object in Figure 4.1. Your current instance of experiential blindness unmasks what you brain normally does so automatically and effortlessly. Without prior experience, sensations are meaningless, and you would not know how to act in the world.

To cure your experiential blindness, please look at the figure on the last page of this chapter, then look back at Figure 4.1. If you now see a fully formed object, several important things just happened. First, you *categorized the sensory input* using conceptual knowledge from past experience. No matter how hard you try, you cannot gain introspective access to how your brain accomplished this feat of making incoming sensations from Figure 4.1 a meaningful visual experience. Also, once the conceptual knowledge is applied, it should now be virtually impossible to "unsee" the object—to deconstruct the experience by the sheer force of will. The process of combining incoming sensory input with stored knowledge is ongoing, obligatory, and automatic (which means that you have no sense of agency, effort, or control in constructing your visual experience). Experimental methods are necessary to unmask its workings (or exercises such as the one we are engaged in right now). To you, it feels as if the act of seeing is passive, that seeing is merely the reflexive detection of visual information from the page. You are unaware of the extent to which *your prior knowledge contributes to your own experiences.*

Second, in viewing the image, it is now probably not that hard to infer extra experiential detail—to imagine the soft drone of buzzing, or to feel the delicate flutter of wings. In your mind's eye, you might see the object fly around as it searches for pollen. You might even be able to smell the sweet fragrance of the flower, or see the yellow petals swaying the light breeze. Perhaps you feel the sun warming your skin. The knowledge you bring to bear (as reactivation and recombination of prior experience that is represented in modal systems of the brain) to perceive this bee is *enactive*—as a consequence of predictive coding, your brain performs a *perceptual inference*. Inferring elements that are not immediately present in the visual input (e.g., the lines that link the black and white blobs together into the shape of a bee) creates your visual experience. Inference is considered one of the primary purposes of memory, and it is how experiences of the past inform situated action in the present. You could not survive in the world without this capacity. Some scientists refer to this inference process as *simulation* (e.g., Barsalou, 1999, 2009), in which you connect immediate sensory input with vast amounts of sensory, motor, affective, and other related information stored in memory. Others refer to it prediction (e.g., Clark, 2013). Still others simply call it *categorization* (Barrett, 2006b). Categorization typically is viewed as comprising two processes: (1) accessing and activating a relevant category representation and binding it to a perceived instance, and (2) drawing inferences from knowledge associated with the category and applying them to the instance.

Third, because the primary purpose of categorization is to produce inferences, it *prepares you for situated action.* For people who have experienced bees as part of a beautiful garden and/or as producing a sweet, tasty delight (honey), the image of a bee is calming and bucolic. For these people, seeing a bee might mean moving in to get a closer look, with an associated reduction in heart rate, blood pressure, and skin conductance. For other people who have been stung, with resultant pain and swelling, the image of a bee is terrifying. For these people, seeing a bee might mean freezing, with an associated increase in heart rate, blood pressure, and skin conductance. Or they might wave their arms or run away, with an increase in heart rate and skin conductance but a decrease in blood pressure. These are the sorts of physiological changes that we scientists record when we show study participants images from the International Affective Picture System (IAPS; Lang, Bradley, & Curthbert, 2008) stimulus set (e.g., Bradley, Codispoti, Cuthbert, & Lang, 2001). They arise when your brain predicts how the body should respond in a specific situation (what we have previously referred to as an "affective prediction"; Barrett & Bar, 2009, and what Seth, Suzuki, & Critchley [2012; Seth, 2013] call "interoceptive predictive coding").

Fourth, because categorization is enactive and prepares you for a specific action, it always produces *some kind of automatic change in your physical state*, impacting the internal sensations that contribute to your pleasant or unpleasant core affective tone (Barrett & Bliss-Moreau, 2009; Russell, 2003; Wundt, 1897). The concepts that are used during categorization can be thought of as tools used by the human brain to modify and regulate the body (i.e., homeostasis and allostasis, metabolism, and/or inflammatory processes), to create feelings, and to create dispositions toward action. The actual visceral changes are not necessary for feeling, although some representation of them in the brain (i.e., prediction) is required. In the same way that your brain used prior experience to predict and make meaning of the visual sensations in Figure 4.1, it uses such knowledge to predict and make meaning of bodily sensations. These two meaning-making achievements (of external and internal sensations) are not happening sequentially; they are occurring transactively and simultaneously, as a function of how the brain understands the current sensory array to create a unified conscious moment (cf. Barrett, 2009a). They are not occurring in a single instant, but they comprise a conceptual act that is evolving over time.

Fifth, this process of meaning making rarely happens because of a deliberate, conscious goal to figure things out; more often it occurs as instantaneously, continuously, and effortlessly for internal sensations as it does for external sensations. This is how the brain creates the mind. Whether you experience the situation as a perception or as an emotion depends on your attentional focus. When your brain is foregrounding visual sensations while viewing the bee, you experience a perception—the bee is friendly or dangerous because you are using the affective feelings that correspond to your physical response as information about the state of the world (e.g., Zadra & Clore, 2011; Anderson, Siegel, White, & Barrett, 2012). When your brain is foregrounding sensations from your body, and when these sensations are particularly intense (because such focus has been useful and reinforced in a prior situation like this one, or because you focus explicitly on the sensations), you experience tranquility or distress. In each case, information from the world, the body, and prior experience was present—what differed was the attentional focus within the dynamic conceptualization.

Sixth, prior experiences *seed* the construction of present and future experiences by predicting and therefore shaping the meaning of momentary, incoming sensory input. Why might you automatically experience the calm of a bee buzzing in a bucolic garden, whereas another person might automatically experience the terror of a bee attacking and stinging the body? The answer lies in the nature of prior experience. Actual experiences with bees, movie scenes that involve bees, stories, or simply instruction about bees constitute the knowledge that is used to make sensations meaningful. Your learning history predisposes you to experience sensations from the world and from your own body in particular ways. All things being equal, you have developed experiential "habits"—what you have experienced in the past is very likely what you will experience in the present, because stored representations of the past help to constitute the present (hence, the phrase "the remembered present"; Edelman, 1998). With additional learning or training, it should be possible to change your experiential habits. By deliberately cultivating certain types of experiences, it should be possible to modify the population of representations that are available for use in the present.

Finally, the bee example also illustrates that *states* and *processes* are easy to confuse when it comes to meaning making. Regardless of whether you automatically experience the calm of a bee buzzing in a bucolic garden or the terror of a bee attacking and stinging the body, it is possible to retrieve different concepts related to bees in the next instance, which in turn has the capacity to change the sensations that your brain predicts from your body. The same processes that were engaged during the initial instance of meaning making (creating tranquility or fear) are engaged again, and again, and again. When your bodily response changes, along with the feelings and actions to which you easily have access, you experience this as emotion regulation. If this is correct, then what we call "emotion regulation" does not occur via a special set of emotion-specific processes but instead occurs via the more basic meaning-making processes that are operating all the time to create the flow of mental states that constitute your mind.

Reappraisal, distraction, and other terms might not refer to processes at all, but are descriptions of changes that occur as one mental state flows into another (and one physical state transitions to another) as meaning changes. A series of sequential mental states that are experientially distinct are easy to understand as distinct psychological processes, even though scientists have known for a long time that experiences do not reveal the processes that make them.

To summarize these insights: During the brain's normal process of predictive coding, it performs a continual stream of *conceptual acts* when it applies prior knowledge to incoming sensory input. This was illustrated with you were presented with visual input to construct the visual experience of the bee. It was an "act" on your part rather than a passive event, because you are not merely detecting and experiencing what it is out there in the world or what is going on inside your body—your prior experiences (i.e., knowledge) played a role in creating momentary experience. (To call this construction an "act" does not imply anything deliberate, special, or effortful about the process.) Any conceptual act is embodied, because prior experience, in the form of category knowledge, comes "online" as the activation of sensory and motor neurons, thereby *reaching down* to influence bodily activations and/or their representations and sensory processing. Conceptual acts are also self-perpetuating, such that experiences created today *reach forward* to shape the trajectory of future experiences. Our hypothesis is that this is the way the mind works: The act of seeing the bee was at once a perception, a cognition, and a feeling. All mental states are, in fact, *conceptualizations* of internal bodily sensations and incoming sensory input. These conceptualizations are *situated* in that they use highly context-dependent representations that are tailored to the immediate situation.

There are four broad hypotheses that derive from this view of mental states as situated conceptualizations:

1. Emotions, like other mental state categories, are populations of instances that are tailored to the environment.
2. Each instance of emotion is constructed within the brain's functional architecture for creating situated conceptualizations, involving domain-general core systems.
3. Emotional episodes cannot be deconstructed and reduced into these domain-general systems but instead emerge from their interaction; therefore, the workings of each system cannot be studied alone and must be holistically understood within the momentary state of the brain and body.
4. Emotional episodes, because they are emergent states, have functional features that physical states, alone, do not have.

We address each hypothesis in turn.

Hypothesis 1: Variation

Whereas the faculty psychology approach to emotion is a textbook case of classical typological thinking (in which emotions are simply organized as a limited number of physical or morphological types), the conceptual act theory makes the more complex assumption that emotion words such as "anger," "sadness," "fear," and so forth, refer to abstract categories that contain a variety of unique instances. Within each abstract category, say, *anger*, or *fear*, instances (emotional episodes) vary in their physical manifestations (heart rate can go up or down, there can be avoidance or approach, etc.) that reflect different avenues of coping with particular kinds of situations. In this view, emotional episodes are situated affective states that are tailored to the immediate situation (for congruent views, see Cunningham, Dunfield, & Stillman, Chapter 7, and Ortony & Clore, Chapter 13, this volume). If each emotion category represents a population of instances, then experiments can be designed to model and capture the fully variety in those instances (rather than attempting to evoke only the most typical instance in the laboratory, which, ironically still produces variation that then has to be explained after the fact). For example, in our lab, we explicitly studied how neural responses differ during fearful instances of social threat and physical danger, as well as how neural responses during fear and anger are similar when experienced in a similar context (e.g., social threat) (Wilson-Mendenhall et al., 2011). In fact, a growing number of studies are designed explicitly to capture heterogeneity within emotion categories, both within individuals and across cultures (e.g., Ceulemans, Kuppens, & Van Mechelen, 2012; Hortensius, Schutter, & Harmon-Jones, 2012; Kuppens, Van Mechelen, & Rijmen, 2008; Kuppens, Van Mechelen, Smits, De Boeck, & Ceulemans, 2007; Nezlek & Kuppens, 2008; Stemmler, Aue, & Wacker, 2007).

There appear to be at least five sources of the variation within a category of emotion: (1) behavioral adaptations that serve as affective predictions about how best to act in a particular situation, (2) concepts that develop for emotion, (3) vocabulary used for emotions, (4) the types of situations that arise in different cultures, and (5) stochastic processes. Each of these is discussed briefly in turn.

Behavioral Adaptations

As a human, you have a variety of "behavioral adaptations" that help you "survive and thrive." Like other animals, you can flee, freeze, fight, and so on. Many of these adaptations are preserved options for dealing with threat and achieving safety (LeDoux, 2012). Upon the presentation of new sensory input, your brain quickly and efficiently predicts which action will be optimal given the current situation, constituting an affective prediction (Barrett & Bar, 2009). In humans, these adaptations are neither necessary nor sufficient for emotion: You do not routinely freeze, flee, or fight in emotion, and when you do, it is not always in the way prescribed by emotion stereotypes (e.g., people can withdraw during anger or fight during fear). Even in a rat, there is no necessary one-to-one correspondence between a particular behavioral adaptation and an emotion category (e.g., Barrett, 2012; LeDoux, 2012); depending on the context, a rat will flee, freeze, or defensively tread (i.e., aggress) in a threatening situation.

Concepts That Develop for Emotions

The brain state corresponding to an emotional episode is not just whatever happens in the body, in the subcortical neurons responsible for fighting, fleeing, freezing, or mating, and so forth, or in the brain regions that represent or regulate the body (e.g., the insula, amygdala, and orbitofrontal cortex). Our hypothesis is that the brain state for an emotional instance is a representation of the state of affairs in the world in relation to that physical state; both sensations from the world and from the body are made meaningful by information stored in the brain from past instances, and so include a neural representation of whatever portion of that information is being used. Thus, the second source of variation within an emotion category derives from the conceptual knowledge that it contains.

A concept can be viewed as aggregated memories that accumulate for a category across experiences with its instances. By focusing attention on some aspect of experience repeatedly, you develop a concept over time from instances of the respective category experienced across situations (Barsalou, 1999; Barsalou & Hale, 1993; Murphy, 2002; Schyns, Goldstone, & Thibaut, 1998). The concept of *bee*, for example, aggregates diverse information about the category of bees across a variety of situations into a loosely organized representation that includes properties (e.g., yellow and black, with wings), relations (e.g., flowers), rules (e.g., for something to be a bee, it must have black and yellow stripes, it must fly, etc.), and exemplars (instances of honey bees, carpenter bees, a queen bee, etc.).[1] Concepts develop for all aspects of your experience related to *bee*, including objects, settings, and actions (e.g., *flowers, honey, gardens, freezing, running, swatting, flying, buzzing, stinging*). From simpler concepts, more complex concepts emerge for events (e.g., *strolling in a garden, fear of the bee*). You also develop concepts for a wide variety of internal states (e.g., *aroused, quiet*), and for the properties and relations that describe instances of concepts (e.g., *yellow, fast, sweet, above, after, cause*). Although concepts reflect experience to a considerable extent, they undoubtedly have biological bases that scaffold learning (Barsalou, 1999, 2008; Carey, 2009; Rips, 2010; Simmons & Barsalou, 2003).

Category instances (e.g., a bee) are never encoded alone into conceptual knowledge, even though their context may not explicitly be the focus of attention. Initially, when encoding a category instance of a bee, for example, from actual prior experience with bees, observational learning about bees, hearing stories about bees, being told rules about bees, your brain captures the elements of the setting in which the bee occurs (i.e., other agents and objects), internal sensory (i.e., somatovisceral) cues from the body, as well as actions, instructions from others (in the form of rules) and words (e.g., the phonological form for "bee"). Over time, these situated conceptualizations create a heterogeneous population of information that is available for you to represent new instances of the category *bee*.[2] Later, when your brain requires conceptual knowledge to process some incoming sensory input, it samples from the populations of situated conceptualizations associated with relevant concepts to create a novel situated conceptualization, integrating current sensory input and retrieved (modal) conceptual knowledge (Barsalou, 2009). In this way, a situated conceptualization allows you to interpret incoming information and draw inferences that go beyond the information given.

Once concepts become established in memory, they play central roles throughout cognition and perception (e.g., Barsalou, 2003; Murphy, 2002), and, as we suggest, emotion. As you experience incoming sensory input from the world and the body, you use prior experience to categorize the agents, objects, setting, behaviors, events, properties, relations, and interoceptive inputs that are present. As described in Wilson-Mendenhall et al. (2011), a situated conceptualization is the conceptualization of the current situation across parallel streams of conceptual processing for all of these elements. As information from the current situation registers simultaneously in these processing streams, local concepts in each of these streams categorize the respective information and draw inferences. At a more global level, abstract relational concepts, such as *emotions*, integrate conceptualizations produced by local concepts on the individual processing streams into a coherent representation of the situation, which is constructed to interpret what is happening in the world in relation to the body and mind. Categorical inferences (i.e., predictions) follow, including inferences about how an object or entity is likely to behave, how you can best interact with it, the likely value to be obtained from interacting with it, and so forth, and on a temporal scale, about how situations may unfold during an event. From the perspective of grounded cognition, situated conceptualizations are responsible for producing the action, internal states, and perceptual construals that underlie goal-related activity in the current situation. Because modalities for action, internals states, and perceptual construals are typically active when you learn a concept, situated conceptualizations generate activity in these systems as they become active on later occasions to interpret experience. When the concept for *bee* becomes active in your brain, the situated conceptualization might include representations of situation-specific approach–avoidance actions (e.g., swatting the bee), representations of internal states (e.g., pleasure or displeasure), and

perceptual construals. Not only does *bee* represent perceptual instances of the concept, it also controls interactions and predicts the resultant events.

We have hypothesized that concepts and categories for emotion work in essentially the same way as other kinds of abstract concepts in the conceptual system, where each individual's situated conceptualizations for an emotion (e.g., fear or anger) refer to an entire situation, including both the internal and external sensations (Wilson-Mendenhall et al., 2011). Initially, when your brain is encoding an instance of an emotion category in memory, say, *anger*, we hypothesize that your brain captures the elements of the setting in which the anger occurs (i.e., other agents and objects), internal sensory (i.e., somatovisceral) cues from your body, as well as actions, instructions from others (in the form of rules), and words (e.g., the phonological form for "anger" or "angry"). Over time, these situated conceptualizations create a heterogeneous population of information that is available for you to represent new instances of the category *anger*.

No single situated conceptualization for the concept *anger* need give a complete account of your category for *anger*. There is not one script for *anger* or one abstract representation for *anger*.[3] Consider the actions you might take upon experiencing anger in the following situations. When another driver cuts you off in traffic, you might shout as you slam on the breaks. When your child picks up a sharp knife, you might calmly take it away or ask your child to put it down. When you hear a news report about a bombing or a hurricane, you might turn up the radio. When a colleague criticizes you in front of a group, you might sit very still and perhaps even nod your head and smile. You may tease a friend who threatens your view of yourself, and so on. During these instances, your blood pressure might go up or down, or stay the same—whatever will allow you to prepare for the situated action. Sometimes you will feel your heart beating in your chest, and other times you will not. Your hands might become clammy, or they might remain dry. Sometimes your eyes will widen, but other times your brow will furrow, or you may even smile. On any given occasion, the content of a situated conceptualization for *anger* will be constructed to contain mainly those properties of *anger* that are contextually relevant, and it therefore contains only a small subset of the knowledge available in long-term memory about the category *anger*.[4] Later, when your brain requires conceptual knowledge to construct an instance of *anger*, it samples from the populations of situated conceptualizations, associated with relevant concepts, to create a novel situated conceptualization that integrates current sensory input and retrieved conceptual knowledge. In a given instance, then, the situated conceptualization for *anger* has the potential to change the internal state of the perceiver, because when retrieving information about *anger*, sensory, motor, and interoceptive states are partially reinstated in the relevant aspects of cortex, simulating an instance. The consequence is that accumulating conceptual knowledge for *anger*, for example, will vary within a person over instances as context and situated action demand.

Emotion Vocabulary

According to the conceptual act theory, emotion categories (i.e., the instances that populate them) vary as a function of learning, and in particular, how emotion words shape concept learning. Accumulating evidence shows that words are powerful in concept learning. Words facilitate learning novel categories (Lupyan, Rakison, & McClelland, 2007) and activate conceptual information effectively and efficiently (Lupyan & Thompson Shill, 2012). As early as 6 months of age, words guide an infant's categorization of animals and objects by directing the infant to focus on the salient and inferred similarities shared by animals or by objects with the same name (Fulkerson, & Waxman, 2007; Booth & Waxman, 2002). Words even allow infants to go beyond perceptual features and group things together that look and sound nothing alike (Dewar & Xu, 2009; Plunkett, Hu, & Cohen, 2008). Words also allow infants to extend their working memory span, taking a larger number of objects and chunking them into smaller units that can be more efficiently stored in memory (Feigenson & Halberda, 2008). Xu, Cote, and Baker (2005) refer to words as "essence placeholders," because a word allows an infant to categorize a new object as a certain kind, and to make inductive inferences about the new object based on prior experiences with other objects of the same kind.

Initially, young children are exposed to instances in which caregivers and other adults use emotion words to label and communicate changes in physical sensations and actions (either the child's or other people's), setting the stage for statistical learning of the emotion concept. So when developing a concept of *anger*, for example, the child's brain encodes instances in which the word "anger" or "angry" is used. When an emotion word (e.g., "angry") is explicitly uttered (e.g., by a caregiver or teacher), the brain captures the elements of the setting in which anger occurs (i.e., including the other agents and objects), the internal sensory (i.e., somatovisceral) cues from the child's body, the child's actions and the actions of others, instructions from others (in the form of rules), and words (e.g., the phonological form for "angry"). Our hypothesis is that across unique instances involving different feelings, physiology, and actions, the phonological form of the word becomes the statistical regularity that holds the concept together across instances (cf. Barrett, Lindquist, et al., 2007).

There is evidence that in infants, conceptual learning proceeds via the rational, constructive form of statistical inference (also called *rational constructivism*; e.g., Xu & Kushnir, 2013) that supports inferences about the world and guides behavior. Because emotions are abstract (i.e., emotions are not specific, concrete things in the world that one can point to), language most likely guides selective attention to the changes in internal states that characterize an emotion in a given situation. For example, each time your parent (or some other person) labeled your internal state or behavior with an emotion term when you were a child, or you observed the emotion term being used to label someone else's behavior, you extracted information about that instance (including the phonological form of the word) and integrated it with past information associated with the same term in memory. In this way, the phonological form for the emotion word becomes a perceptual regularity that, when repeateded across situations, underlies formation of the concept for that emotion, even if there are no strong physical similarities in the internal body states or actions from instance to instance within that emotion category (cf. Barrett, 2006b).

The Structure of Situations

Linked to variation within the conceptual system for a given emotion category is variation in the recurring situations that people find important and meaningful for a given emotion within a cultural context. If the conceptual system for emotion is constituted out of past experience, and if past experience is largely structured by people within a cultural context, then both the emotion categories that develop and the population of instances within each category will be culturally relative. Such ideas integrate the conceptual act theory with social construction approaches, positing that interpersonal situations "afford" certain emotions (or certain varieties of an emotion category; see Boiger & Mesquita, Chapter 15, this volume), and with the Ortony–Clore–Collins (OCC) model, in which the structure of emotion categories is thought to represent the structure of recurrent, important situations (see Ortony & Clore, Chapter 13, this volume). The word "affordance" here is meant to convey the idea that as an emotional episode is constructed, and that the construction process is dynamic, proceeding not only within the brain of a single perceiver but also in the transaction with surrounding circumstances. As practices and reinforcements differ within a cultural context, so do the emotional episodes that unfold. In this way, the practices and reinforcements structuring interpersonal situations come from the concepts that people share within a common cultural context; to the extent that concepts are enactive in the moment, they lead people to act in certain ways toward each other. To the extent that these practices and reinforcements shape the immediate emotional episode, they further seed the conceptual system for emotion. Concepts, then, are the carriers of culture.

The word "affordance" might also have a more literal Gibsonian meaning in social construction (i.e., to mean "given by the sensory properties of the world"). For example, conceptualization leads one person to modulate the acoustics of his or her vocalizations while talking to another person, the frequency with which he or she touches another person, or the frequency of certain facial movements (e.g., widening of the eyes). Each of these changes influences the affective state of the other person (i.e., the perceiver) in an immediate way, making certain emotional episodes in that person more or less likely.

Stochastic Variability

A final source of variation in the population of instances for an emotion category is the idea that incoming sensory input and conceptual knowledge do not combine in a deterministic way to create emotional episodes. Instead, they are probabilistic and combine stochastically (which means that there is not one, and only one, behavioral adaptation or conceptual representation for a given situation). Other influences (some of which are random), such as the state of the body or the prior state of the brain, might influence the specific emotional episode that is constructed in a given instance.

Hypothesis 2: Core Systems

According to the conceptual act theory, the brain's architecture can be thought of as a situated conceptualization generator producing the sequences of brain states that correspond to the mental features that a person experiences. As such, an emotion category does not have a single physical essence, such as brain circuit, or a psychological essence, such as an affect program or a pattern of appraisals, to determine the identity of an instance. Although there might be a stereotype, or a schema or script for a category prototype, it is misleading to believe that this represents the most typical instance of each category in an arithmetic sense (cf. Barrett, 2006b; Clore & Ortony, 2013). William James (1890, p. 195), one of the original psychological constructionists (cf. Gendron & Barrett, 2009; but see Scarantino, Chapter 14, this volume), described the danger of essentialism when he wrote, "Whenever we have made a word . . . to denote a certain group of phenomena, we are prone to suppose a substantive entity existing beyond the phenomena, of which the word shall be the name."

Instead of essences (either as a domain-specific system for each emotion type or as a general emotion-specific system such as that in certain accounts of the limbic system), we hypothesize that each situated conceptualization (as a series of brain states) can be understood as a construction that derives from the interaction of more basic, domain-general operations. These operations can themselves be characterized at the psychological level (e.g., Barrett, 2006b, 2012) and are supervenient on (emerging from) different combinations of brain networks that emerge from neural integration

across time and space within the brain (e.g., Barrett & Satpute, 2013; Lindquist & Barrett, 2012; Oosterwijk et al., Chapter 5, this volume). Such basic operations are akin to the "mental state variables" (see Salzman & Fusi, 2010), facets, or core systems that describe the brain state. Rather than presuming that each network functions in a modular, mechanistic way, each operation can be thought of as arising as a family of "functional motifs" (i.e., patterns of activation) within the structural motif (i.e., the anatomical connectivity) that undergirds each network (e.g., Sporns & Kotter, 2004). Moreover, if these operations are the functional architecture for the mind, then the science of emotion should focus on modeling emotions as high-dimensional brain states within this architecture (reflecting the engagement of domain-general networks, their internal operations, and their interactions).

At the psychological level of description, the conceptual act theory hypothesizes that an instance of emotion is constructed when physical changes in the body (or their corresponding affective feelings) are made psychologically meaningful because they are related to or caused by a situation in the world. Physical changes are occurring all the time in your body: Blood pressure is going up and down, breathing rates speed and slow, voluntary muscles contract so that limbs move. Your affective feelings of pleasure and displeasure with some level of arousal, which in part are based on your body's moment-to-moment homeostatic and energy changes, are ever-present and always changing. However, only sometimes do you perceive these changes as being causally related to surrounding events, and when this happens, an emotion is constructed (this occurs whether or not you are aware that it is happening and whether or not you experience effort or agency, or have an explicit goal to make sense of things). To put it more formally, emotional episodes, no matter the category, are created with at least two domains of core systems: a system (or systems) for representing sensations related to the body (which is usually referred to as "affective"), and a system (or systems) for conceptually making sense of these sensations and/or feelings in relation to the situation (including the language network). Categorization is not specifically directing the construction of emotional episodes—it is necessary for every mental event. If you are awake, you are categorizing.

The conceptual act theory also proposes that the brain's matrix of attentional networks is an additional domain-general core system that supports constructing emotions (including the endogenous attention that is linked to goals and values) (Barrett, Tugade, & Engle, 2004; see also Cunningham et al., Chapter 7, this volume). In our view, an individual is more likely to experience an emotion when conceptual knowledge for emotion is reactivated, because attention foregrounds ongoing affective changes that are occurring in relation to a specific situation in the world (in contrast, an individual is more likely to experience a perception when attention is directed to events in the world; Barrett, 2009a). Although affective changes are always ongoing, it is only when they are foregrounded that they are experienced as emotional.

As we noted earlier, other systems important to constructing emotional episodes also include the circuits for basic behavioral adaptations such as freezing, fleeing, and fighting, although no one-to-one correspondence is necessary between a behavior and an emotion category (e.g., Barrett, 2012; LeDoux, 2012). When your brain predicts that one of these behavioral adaptations might be necessary in the immediate situation, you may experience affective changes even when the prediction is modified and the action is not realized (Barrett & Bar, 2009; Clark, 2013).

Hypothesis 3: Constructive Analysis

Instead of reducing situated conceptualizations to these core systems, the conceptual act theory directs scientists to take a constructive analytic approach to understanding how situated conceptualizations arise from their ongoing interaction over time. Reductionism is impossible, because any situated conceptualization (as a sequence of brain states) contains properties that emerge at a different level of integration from the individual networks that construct them (referred to as *emergentism*). The idea is that a composite whole has properties not evident in its individual parts. The concept of emergentism has long been a key assumption of psychological constructionist accounts; emotions have been described as "psychical compounds" (Wundt, 1897), "unanalyzable wholes" (Harlow & Stagner, 1932), and "emotional gestalts" (Barrett, Mesquita, et al., 2007). The conceptual act theory highlights the importance of analyzing and understanding emotions as integrated wholes.

The idea that emotional episodes are emergent has become popular over the past decade. Nearly all psychological construction approaches to emotion make this assumption, as evidenced throughout this volume. The conceptual act theory is somewhat unique, however, in also proposing that reductionism is ill-advised, because the function of each network within the brain's functional architecture is conditional on the whole system in that instance (referred to as *holism*; for a discussion of holism, see Harrington, 1987). Holism is the other side of the coin from emergentism. If emergentism is the idea of studying properties of a whole system that no part alone can produce, then holism is the idea of studying the interacting parts in a complex system, or never studying a part alone, out of context (also called *contextualism* or *compositionalism*). Holistic thinking means that it is not possible to know how a part of a system works without considering its role in the whole system. To be clear, the problem is not in attempting to break a mechanism down into its smallest definable bits; the problem is that those bits cannot be studied independently of one another like parts of a machine.

In the conceptual act theory, the core systems of the brain's intrinsic architecture are the neural "ecosystem" that creates brain representations that transition through time, from which a mental event, such as an instance of emotion, emerges. These ideas are very consistent with the hypothesis that the brain is a predictive organ that creates mental states by a process called "predictive coding." It continually generates hypotheses based on past experience in a top-down fashion and tests them against incoming data (e.g.,Adams et al., 2013; Bastos et al., 2012; Clark, 2013; Friston, 2002; Hohwy, 2013; Shipp et al., 2013). As a result, an analytic strategy of constructive analysis, rather than reductionism, is preferred. Understanding how emotions are constructed does not require ontologically reducing them out of existence. Instead, it requires understanding the dynamics of how core systems interact and influence each other through time. This represents a serious analytic challenge for psychological constructionism at the moment, however, since most data-analytic and modeling strategies are based on reductionist mathematical models (for alternatives, see Herschbach & Bechtel, Chapter 2, and Coan & Gonzalez, Chapter 9, this volume; Coan, 2010; but then see Barrett, 2011).

Theoretical need often spurs methodological development, however. For example, in a recent article, Raz et al. (2012) reported the development of a network cohesion index that can be used to investigate how the dynamics of interacting brain networks over time are related to self-reported emotional experience and to peripheral nervous system arousal. Subjects passively watched movies during functional magnetic resonance imaging (fMRI) scans, then after the scan, watched the films again, continuously rating the intensity of their emotional experiences. The fMRI blood-oxygen-level-dependent (BOLD) signal collected during movie watching was used to compute the connectivity between brain networks across time using a sliding time window of each movie (i.e., what the authors refer to as a network cohesion index). The dynamic changes in network cohesion during the movie clips predicted the moment-to-moment self-reported changes in the intensity of emotional experience during the clip.

Unlike constructive analysis, most analytic approaches applied within the science of emotion are stimulus driven and assume some version of the Stimulus → Organism → Response model, in which the causal mechanism for an emotion is "off" until it is switched "on" by the properties of a stimulus (whether physical or appraised). This assumption uses the logic of an experimental trial as a metaphor for how the mind works. In contrast, the conceptual act theory is, to a large extent, unmoored from the exteroceptive stimulus as the triggering event for the unfolding emergence of an emotional episode. The state of core systems within the brain before the onset of the stimulus (and perhaps even the process of deciding between stimulus and nonstimulus) is as important to the scientific explanation of emotion as the subsequent perturbations of the systems. The mind is understood as brain and body in context (usually in the context of other brains and bodies), transitioning from one state to another over time, with conceptualization creating emotional episodes that reflect a series of these state transitions.

Hypothesis 4: Social Ontology

When emotions are viewed as mental faculties that correspond to physical types, they are often said to have evolved to solve a specific functional need. Shariff and Tracy (2011, p. 396), for example, believe that emotions have evolved specifically to deal with "recurrent environmental events that pose fitness challenges." This view of emotion (along with similar typological views) are explicitly called "evolutionary," leading to the unfortunate and mistaken implication that psychological constructionist views are not consistent with the principles of evolution. At issue is *what* evolved, however, not *whether* emotions emerged in an evolutionary context. In our view, the emotion faculty approach to emotion suffers from the weaknesses of the "adaptationist programme" discussed out by Gould and Lewontin (1979), not the least of which is that natural selection is presumed to be teleological. Emotions are thought to have evolved to serve specific functions because a need for those functions existed (but for a discussion of how this view of emotions exemplifies the error of arbitrary aggregation, see Barrett, 2006c).

The conceptual act theory instead proposes that a neural architecture supporting situated conceptualizations evolved as the ability to conceptualize physical states in a context-specific fashion, and that it underlies other mental phenomena besides emotions. As such, it is possible to discuss *what* functions situated conceptualizations serve (the utility question) without answering the question of *why* they came to exist (which itself is a very interesting and important question with multifaceted and complicated answers). In our view, the utility of emotions does not necessarily reveal anything about their ultimate reason for existing.

Our hypothesis is that when physical sensations, such as one's own interoceptive state, and others' movements and vocalizations, are conceptualized as emotions, those sensations take on functions that they would not normally have on their own (i.e., by virtue of their physical structure alone; for a full discussion, see Barrett, 2012). They are what philosophers call "social reality." Conceptualization supports five functions that are necessary for getting along and getting ahead in social life: (1) It prescribes specific, situated actions (over and above approaching and avoiding); (2) it allows communication about many aspects of experience and the situation

efficiently, with a word or two; (3) it creates meaning about the social value of the physical sensations, over and above their immediate sensorial valence and arousal; (4) it provides an avenue for social influence (as a bid to control the mental states and actions of another person) over and above the valence and arousal of vocal prosody or facial actions; and (5) it represents a way to use prior experience (including cultural learning) to influence momentary homeostasis, glucose metabolism, and inflammatory responses, over and above the immediate properties of any physical stimulation.

To say that emotional episodes exist in the domain of social reality does not deny that an instance of emotion exists in nature. Instead, it highlights the hypothesis that their physical nature involves not only the parts of the brain that are involved in homeostasis, interoception, and motor movements (limbic and motor tissue), but *also* those parts of the brain (often in concert with other brains) that are necessary for making meaning of those physical changes. Said another way, an emotional episode corresponds to a series of brain states that include both parts of the brain that represent and regulate the body (limbic tissue, motor cortex) and the additional information necessary for creating the new functions that create emotions from physical sensations—that is, the parts that are crucial for creating the conceptualizations necessary for emotional gestalts.

Evolution has endowed humans with the capacity to shape the microstructure of our own brains, in part via the complex categories that we transmit to one another within the social and cultural context. This means that even though emotions are real in the social world, they both cause and are caused by changes in the natural world. They can be causally reduced, but not ontologically reduced, to the brain states that create them. To more fully explain how humans get to social reality (e.g., emotions) from the properties of the natural world—that is, to explain social reality in physical terms—it will probably be necessary to study a human brain in context (including in the context of other functioning human brains in real time).

In our view, then, changes in heart rate or blood pressure, facial actions such as smiles or frowns, and behaviors such as crying or freezing in and of themselves are not evidence of emotions, and the fact that these behavioral adaptations are shared with nonhuman animals is not evidence that emotions are shared with other animals. Instead, these physical changes become part of an emotional episode when they take on a certain meaning in a certain situation. The adaptations, themselves, might be species-general, but the capacity to make additional meaning of them is a species-specific adaptation that evolves in humans (Barrett, 2006a, 2012). And with this meaning-making came additional flexibility in deploying these adaptations that is also likely species specific for humans. But the basic point is that via situated conceptualizations, physical changes acquire the ability to perform functions that they do not have on their own (creating social meaning, prescribing actions, allowing communication, aiding social influence). In this view, category knowledge about emotions does not *cause* emotions per se; it *constitutes* emotions by adding epistemologically novel functions to sensory input and action. Put another way, an emotion is constructed when embodied conceptual knowledge is enacted to shape the perception of sensory information from the body and the world, binding a physical state to an event in the world (as opposed to being merely a physical sensation or action). A bodily state or an action has a certain physical function (e.g., changes in respiration might regulate autonomic reactivity or widened eyes increase the size of the visual field), but neither event intrinsically has certain functions *as an emotion*; events acquire those functions in the act of categorizing them as emotion during the construction of a situated conceptualization.

Concluding Remarks

Given that the conceptual act theory is about a decade old, it is not surprising that many of its key formulations represent hypotheses yet to be tested. Perhaps its main value at present is to prescribe a different scientific paradigm for the design and interpretation of experiments (to seek out explicitly and model variation *within* each emotion category rather than attempting to aggregate across instances to find the essence of each category, and to engage in complex analysis of interacting domain-general systems over the time that an emotional episode unfolds). But the conceptual act theory holds other insights for the science of emotion. Its use of population logic and constructive analysis brings it closer to a Darwinian approach to emotion than the basic emotion models that usually claim Darwin as their intellectual heir (cf. Barrett, 2013). The conceptual act model also unites emotional experience and emotion perception within a single theoretical framework, with a single set of common domain-general mechanisms involved in mind–perception (Barrett, 2006a), suggesting, for example, that one's state as a perceiver is as important during an act of emotion perception as during an act of emotional experience (Anderson et al., 2012). The conceptual act theory also represents a set of hypotheses for how the phenomena that we refer to as *emotion* and *emotion regulation* are derived within a common mechanistic framework (Barrett, Wilson-Mendenhall, & Barsalou, 2014). Specifically, we view emotion regulation as occurring in the more basic meaning-making processes that are operating all the time. As such, reappraisal, distraction, and other terms do not refer not to processes but to changes that occur from one mental state to another (and from one physical state to another) as meaning changes.

Finally, the conceptual act theory also represents an opportunity to unify theories of how the brain creates the mind. Faculty psychology traditions carved up human brain imaging research into at least three sister disciplines—affective, social, and cognitive neuroscience—but we unite social, affective, and cognitive neuroscience within one constructionist functional brain architecture (Barrett & Satpute, 2013). Emotions, social cognitions, and nonsocial cognitions (and perceptions, which for this chapter we include in the category "cognition") are better thought of as mental events (prompted by specific experimental tasks, or arising as naturally occurring states) that are constructed from interactions within and between these networks that compute domain-general functions. There is no "affective" brain, "social" brain, or "cognitive" brain. Each human has one brain whose functional properties can be understood differently for different timescales and levels of organization.

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NOTES

1. Throughout this chapter, we use italics to indicate a concept (e.g., *car*) and quotes to indicate the word or phrase associated with it (e.g., "car").

2. Theory and research strongly suggest that concepts do not have conceptual cores (i.e., information that is necessary and sufficient for membership in the associated category). Instead, concepts are represented with loose collections of situated exemplars that are related by family resemblance. Exemplar theories of categorization further illustrate that loose collections of memories for category members can produce sophisticated classification behavior, demonstrating that abstractions for prototypes and rules are not necessary. Neural net systems similarly demonstrate that only loose statistical coherence is necessary for sophisticated categorization. To the extent that abstraction does occur for a category, it may only occur partially across small sets of category instances, reflect the abstraction of nondefining properties and relations that can be used to describe category members in a dynamcial manner, or reflect an online abstraction at retrieval, rather than stored abstractions in memory. Nevertheless, people often believe mistakenly that categories do have cores, perhaps because a word can lead people to essentialize.

3. As goal-directed categories that develop to guide action, the most typical member of a category such as fear is not the one that is most frequently encountered,

but rather the one that maximally achieves the theme or goal of the category (Barsalou, 2003). As a result, the most typical instances of a category contain properties that represent the ideal form of the category—that is, whatever is ideal for meeting the goal around which the category is organized—not those that most commonly appear as instances of the category. From a situated conceptualization viewpoint, prototypes do not exist as stored representations in memory, but they can be constructed (or simulated) when needed (Barsalou, Niedenthal, Barbey, & Ruppert, 2003).

4. Highly different instances for the same category can become integrated over time, and become available to construct novel simulations that have never been experienced before. This, in part, may help to explain why people believe that emotions such as anger, sadness, fear, and so on, have specific response signatures, even though the available data do not support this view. A simulation of *fear* could allow a person to go beyond the information given to fill in aspects of a internal sensation that are not present at a given perceptual instance. In such a case, the simulation essentially produces an illusory correlation between response outputs, helping to explain why researchers continue to search for coordinated autonomic, behavioral, and experiential aspects of a *fear* response.

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