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The Context Principle

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Scientific disciplines categorize. They divide their universe of interest into groupings or "kinds," name them, then set about the business of understanding those kinds in a scientifically valid way. This categorization process functions like a sculptor's chisel, dividing up the world into figure and ground, leading scientists to attend to certain features and to ignore others. One consequence of scientific categorization is that we sometimes essentialize our subject matter, then search for evidence of those essences, without considering how context might influence or contribute to its very nature. William James observed this a century ago, 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" (1890, p. 195). James knew that words do not just name a category. They encourage a very basic form of essentialism that, Paul Bloom (2004) argues, is already present in how people often think about the events and objects in their everyday lives. A word can function like an "essence placeholder," encouraging psychological essentialism: A word can convince the perceiver that there is some deep reality to the category in the material world (Barsalou, Wilson, & Hasenkamp, Chapter 16, this volume; Medin & Ortony, 1989), even in young infants (e.g., Dewar & Xu, 2009; Xu, Cote, & Baker, 2005). The main consequence of essentializing is that people ignore the influence of context.

THE ESSENTIALISM ERROR: AN EXAMPLE FROM MOLECULAR GENETICS

A particularly salient example of this essentialism error comes from the study of genetics (also see Harper, Chapter 2, this volume). When molecular biologists first began to study the units of inheritance, inspired by Mendel, they searched for and found *genes*—bits of deoxyribonucleic acid (DNA) that make the proteins needed to constitute the human body. Yet only a small proportion of human DNA (estimated between 2 and 5%) was *genes*; the rest of the stuff (that does not directly produce proteins) was labeled "junk," on the assumption that it was largely irrelevant to the biological understanding of life. As it turns out, however, "junk DNA" has some rather important functions, including regulation of *gene expression* (i.e., turning on and off protein production) in a contextually sensitive fashion (for a generally accessible review, see Gibbs, 2003). Scientists have discovered that much of what makes us human, and what makes one person different from another, lurks in this junk. In fact, even with the completely sequenced human genome, it is not possible simply to produce a human being from scratch because a human is not computed from genes alone. It is not really possible to answer a question like "Which genotype causes depression?" without specifying the environments in which a person developed and in which depression occurred.

Even when scientists do consider the environment, the concept of a "gene" can mistakenly lead to the assumption that there is only a single environment in question. To some extent, this misses the important transactional process by which an organism determines which elements of the external world make up the functional environment at any one point in time. As a consequence, there are a variety of potential environments in any physical surrounding, with a creature's current state making certain environments more likely or impactful than other potential environments at the same moment in time. These observations mean that even a static model of *gene–environment interaction* (where the genes determine an organism's capacity or tendency that is released by the environment) is still too essentialist (for a discussion, see Lewontin, 2000).

These sorts of observations have produced nothing short of a revolution in molecular genetics. Scientists now know that genes, in and of themselves, do not provide a sufficient recipe for life. The unit of selection is not the gene, but the individual, who, for the purposes of molecular genetics, can be thought of as a bundle of genes that are turned on and off by the rest of our DNA, which is regulated by the epigenetic context. The building blocks of evolution are a set of context-dependent processes, not a set of unitized elements.

THE ESSENTIALISM ERROR IN PSYCHOLOGY

The essentialism error—with its disregard of context—is particularly notable in the Western psychological tradition. Western models of the mind chunk and name phenomena with nouns (which encourage essentialism) as opposed to words that refer to processes (e.g., verbs; see Barsalou et al., Chapter 16, this volume). The process of categorizing and naming in much of psychology seems to have produced a deep commitment to the view that behaviors and mental states, and even people themselves, are determined by deep and unchanging internal forces. The goal (at least in Western psychology) is often to identify mental states, behaviors, and traits as natural entities that "cut nature at its joints," often without considering the influence from the environment. Even behaviorists like John Watson were psychological essentialists. John Watson observed and wrote about tremendous variability in emotional behaviors with the same name (e.g., *fear*), yet he assumed that a Platonic behavioral pattern must exist for each emotion even though he could not see it—very ironic for a behaviorist.

Of course, psychologists cannot dispense with naming categories, and categories call for names. But a name does not necessarily point to an essence.

In psychology, there is a great risk of confusing words with the phenomena that are of real interest. The questions that psychologists ask and the interpretations we offer often reinforce our natural (Western) tendencies toward psychological essentialism and away from the importance of context. Take, for instance, research on what is referred to as *fear learning*. In much of this research, rats are placed in a 9" × 12" spare box with grating on the floor. An auditory tone is paired with electric shock (delivered through the floor), so that when the animal hears the tone alone, it freezes (i.e., does not move except for respiration; e.g., LeDoux, Cicchetti, Zagoraris, & Romanski, 1990). The amygdala is necessary to produce this freezing response, leading many scientists to argue that the amygdala is the brain locus of fear. But, as it turns out, rats do not always freeze when faced with a threat. When the context gives them the opportunity (e.g., in a multiarmed testing chamber), rats escape from threat (e.g., Vazdarjanova & McGaugh, 1998). At other times, rats kick up their bedding in the direction of the threat (called *defensive treading*; Reynolds & Berridge, 2002, 2003, 2008). Physiology follows the behavior, not the category of emotion. When rats are restrained during threat, their blood pressure goes up; when they are free to escape, their blood pressure goes down (Iwata & LeDoux, 1988). In using the word *fear* to refer to behaviors as varied as freezing, escape, and defensive treading, not to mention feelings of worry, dread, and

viewing startled looking faces, scientists are lulled into thinking these behaviors all share a deep property, and they will spend years searching for it in vain.

This example often prompts researchers to ask what the amygdala's function is, if not to create fear. An answer can be found in other research findings. The uncertainty of shock predicts sympathetic nervous system responses (organized by the central nucleus of the amygdala) better than does the intensity of shock during classical conditioning (Arntz, Van Eck, & de Jong, 1992). The amygdala is reliably responsive to novel objects (e.g., Breiter et al., 1996; Schwartz, Wright, Shin, Kagan, & Rauch, 2003; Weierich, Wright, Negreira, Dickerson, & Barrett, in press; Wilson & Rolls, 1993; Wright, Wedig, Williams, Rauch, & Albert, 2006) and novel (neutral) faces across the lifespan (Wright at al., 2008). Amygdala activity is associated with orienting responses (e.g., Holland & Gallagher, 1999), and amygdala lesions disrupt normal responses to novelty in primates (e.g., Burns, Annett, Kelley, Everitt, & Robbins, 1996; Mason, Capitiano, Machado, Mendoza, & Amaral, 2006; Prather et al., 2001). When uncertainty increases, so too does the amygdala's response (Herry et al., 2007), yet the amygdala habituates quickly to fearful faces (Wright et al., 2003). The findings together suggest that the amygdala functions to help direct attention (Holland & Gallagher, 1999) toward sensory stimulation when the predictive value of that stimulation for well-being and survival is unknown or uncertain, or when the appropriate response to a stimulus is unclear. Some people might argue that uncertainty is an ingredient of fear, and this might be so, but it is surely not specific to or interchangeable with the category "fear." But more importantly, uncertainty is inherently a context-dependent phenomenon.

The pervasiveness of essentialism has shaped Western psychology to its very core. Models of the mind have become fragmented as psychologists have come to assume that emotion, memory, the self, attitudes, personality traits, and so on, are different entities with distinct organizing principles and causes (Bruner, 1990). Furthermore, relationships between these entities are referred to as *interactions*. Cognition and emotion, for example, are said to influence one another, as if they are independent and separable mental phenomena.

Psychological essentialism has also led researchers to ignore variation and to treat it as psychological noise. In many cases, variation in psychological states or behaviors referred to by the same name is considered to be error (i.e., the measured variance that is not of interest). Moreover, studies are designed to control the context either experimentally or statistically minimize variability. By focusing on a mental state or behavior in isolation, it is easy to miss its embeddedness in a

larger system that gives it its nature. It is easy to miss the forest for the trees.

FROM ESSENTIALISM TO CONTEXT

Amid this essentialism has lurked the idea that psychological states, traits, and behaviors are not entities but events constructed out of a more basic set of processes (Gendron & Barrett, 2009). And processes, unlike entities, are shaped by context. Mental events and human behaviors can be thought of as states that emerge from moment-by-moment interaction with the environment rather than proceeding in autonomous, invariant, context-free fashion from preformed dispositions or causes. Inherently, a mind exists in context. We call this the *context principle*.

Context, of course, can refer to many things. One process within the brain or body can serve as a context for another process (e.g., Sporns, Chapter 3, this volume). One psychological process can serve as the context for another psychological process or its product (e.g., Dunham & Banaji, Chapter 10; Schwarz, Chapter 6, this volume). The immediate physical surroundings or the social context (i.e., other people) can serve as the context (e.g., Bouton, Chapter 12; Dunham & Banaji, Chapter 10; Harper, Chapter 2; Mesquita, Chapter 5; Mischel & Shoda, Chapter 8; Prentice & Trail, Chapter 13; Richardson, Marsh, & Schmidt, Chapter 15; Sinclair & Lun, Chapter 11; Smith & Collins, Chapter 7; van Anders, Chapter 4, this volume). Phase of life or sociocultural environment can serve as a context (e.g., Adams, Salter, Pickett, Kurtiş, & Phillips, Chapter 14; Kitayama & Imada, Chapter 9, this volume). Even time can serve as a context (e.g., Bouton, Chapter 12, this volume). The basic idea is that the observables of psychology—thoughts, feelings, actions—are not driven by single causes but are the emergent results of multiple transactive processes.

History of the Context Principle in Psychology or "the Mind in Context"

The context principle has a long history in psychology. It can be observed in Wundt's attempt to understand psychological events as psychic compounds that are embedded and influenced by the social surroundings (Wundt, 1894/1998). Wundt advocated an early form of *emergentism*, where thoughts, emotions, actions, and so forth, are not static things or entities but are instead "psychical compounds" or composites that constitute "psychical elements" (that are simple and irreducible in a psychological sense) (Gendron & Barrett, 2009). He wrote about psychological

phenomena as acts or processes rather than as static entities or objects with constant properties (see also Mesquita, Chapter 5, this volume). Furthermore, Wundt explicitly wrote about the social and cultural context as a necessary contribution to each individual person's mental life (what Wundt called *Volkerpsychologie*, which means social or cultural psychology but was mistranslated by Edward Titchener as "folk psychology"; for a discussion, see Danziger, 1983). According to psychological historian Kurt Danziger's description of Wundt's *Volkerpsychologie*,

> Psychological laws were not abstract principles, conceived on the model of classic mechanisms, that could be applied analogously on the individual and on the social level. Rather, they were developmental principles that expressed the kinds of changes that mental contents underwent in interaction with a medium (Wundt, 1886b). That medium was environmental and social as well as physiological. (Danziger, 1983, p. 307)[1]

The context principle can also be found in John Dewey's (1896) discussion of the reflex arc. Dewey denied that sensations were the stimuli, that responses were the effects, and that both were separable bits and pieces, like parts of a machine. Rather, both were like ingredients in a recipe, coordinated over a series of iterations to produce some mental event serving some kind of function. In Dewey's view, a response provides the context for the next round of sensation, and the "stimulus" itself emerges out of this coordination (see also Richarson et al., Chapter 15, this volume). This idea of context ran counter to that of the standard stimulus–cognition—response logic offered contemporaneously by Baldwin (1891) and rediscovered during the cognitive revolution in psychology. Ignoring the arc, in Dewey's words, erroneously leads psychologists to search for the explanation of behavior "in either an external pressure of 'environment,' or else in an unaccountable spontaneous variation from within the 'soul' or the 'organism'" (1896, p. 360). It leads psychologists toward a false kind of dualism that mistakenly essentializes either the stimulus or the person.

The context principle is most clearly embodied in the basic assumptions of social psychology, which developed in the early part of the 20th century as the scientific discipline devoted to the study of situational influences on the mind and behavior. The context principle is clearly embodied in Kurt Lewin's (1935) heuristic equation $B = f(P, E)$, where a behavior at a given point in time is a function of the person and his or her momentary context. Although earlier formulations of Lewin's equation took a more essentialist stance on context, examining the *influence* of the situation on mental events and behaviors, Lewin's later views were more nuanced, treating the person and the situation as transactional factors that realize behavior. From this perspective, mental events and

behaviors are performances of context (Markus, 2008; Steele, 1997). Persons and situations are not separable sources of variation that interact and influence each other. They help to constitute each other. Similar considerations led Walter Mischel to study personality as a set of context-contingent regularities, highlighting that behavior is not the expression of some sort of essential "trait," but rather materializes in a transactional, context-specific manner (Mischel, 1968; Mischel & Shoda, Chapter 8, this volume).

In the mid-20th century, Egon Brunswik (1955a, 1955b) emphasized that the science of psychology should pay as much attention to the properties of the environment as it does to the organism itself. He emphasized the idea of *object sampling*, meaning that in experiments, various aspects of psychological environment should be explicitly sampled from the larger physical environment, just as subjects are sampled from a larger population of individuals. In Brunswik's view, elements of the environment were not essentialized but were themselves contextually determined. Like Dewey's discussion of the reflex arc, Brunswik's lens model specified a transactional (or what we might now call *recursive*) relation between the organism and its immediate environment, so that the outcome of one psychological state (be it a perception or a behavior) is the prior condition that set the stage for the next. Like Dewey, Brunswik criticized the artificiality inherent in the classic stimulus–organism–response (S-O-R) experiment. Person and context mutually constitute each other rather than interacting in a strict, independent fashion. Beginning in the mid-1960s, this view was developed considerably by Mischel, who demonstrated (as noted above) that even a personality cannot be understood without reference to the context (see Mischel & Shoda, 1995, and Chapter 8, this volume).

During the cognitive revolution, Jerome Bruner (1988, 1990) proposed that the study of cognition should focus on a contextualized understanding of the human mind. Bruner argued that psychology's task was to "discover and to describe formally the meanings that human beings created our of their encounters with the world, and then to propose hypotheses about what meaning-making processes were implicated" (1990, p. 2). Bruner's main argument was that human psychology is about meaning, which by definition "itself is a culturally mediated phenomenon that depends upon the prior existence of a shared symbol system" (p. 69). Thus, according to Bruner, context shapes the human mind. "It does so by imposing the patterns inherent in the culture's symbolic systems—its language and discourse modes, the forms of logical and narrative explication, and the patterns of mutually dependent communal life" (p. 4). Bruner's ideas form the foundation of cultural psychology, whose basic thesis is that many, though not all, of our mental models are cul-

tural and shared in nature (Markus & Kitayama, 2003; Nisbett, 2003; Shore, 1996; Shweder, 1991b). This is not to say that culture determines thought in a homogenized fashion. Rather, the artifacts of culture—the ways that relationships are organized and structured—afford certain ways of thinking and feeling (Markus, Mullally, & Kitayama, 1997).

Implications of the Context Principle

The context principle helps scientists understand that the very definition of something as basic to psychology as "behavior" is contextually determined. Social psychologists who study person perception distinguish between *behaviors* (intentional, bounded events) and *actions* (descriptions of physical movements) (e.g., Vallacher & Wegner, 1987).[2] These meaning-filled events are neither observer-independent nor context-independent. Social psychology has accumulated a large and nuanced body of research on how people come to see the physical movements of others as meaningful "behaviors" by inferring the causes for those movements (usually by imputing an intention to the actor; for a review, see Gilbert, 1998). People and animals are constantly moving and doing things—that is, they are constantly engaging in a flow of "movements." A perceiver automatically and effortlessly partitions continuous movements into recognizable, meaningful, discrete acts using category knowledge about people and animals (Vallacher & Wegner, 1987). As we discussed earlier, a rat that kicks up bedding at a threatening creature is said to be defensive treading or in a state of fear. Similarly, standing still in response to a sudden tone that predicts an electric shock can be called freezing or fear. It can also be called an alert, behavioral stance that allows an organism to martial all its attentional and sensory resources to quickly learn more about a stimulus when its predictive value is uncertain (cf. Barrett, Lindquist, Bliss-Moreau, et al., 2007).

Moreover, cultural settings have a role in translating an action into a behavior. The "mutually interacting intentional states of the participants" constitute the meaning of behavior (Bruner, 1990, p. 19). These intentional states have been shown to vary across contexts of meaning. For instance, in highly interdependent cultures and relationships, withdrawal from the relationship may be recognized as an expression of anger; this is less so in environments in which active engagement is less the norm (Mesquita, 1993). In Japanese kindergartens, teachers do not interfere in fights among the children because they believe that this behavior is conducive to the development of sympathy and perspective taking. In contrast, American teachers interpret this lack of intervention as neglectful. Similarly, in a North American context, voluntary actions are interpreted as "choices" originating from individual preferences and

goals, but in an Indian context, they are understood as responses to social roles and the expectations of others (Savani, Markus, Naidu, & Kumar, 2009). These examples demonstrate that similar actions derive their meaning from the specific cultural framework in which they are produced and understood.

Even the "situation" is not elemental and is itself contextual, in part being determined by the person (who acts as a form of context). Physical surroundings exist separately from observers, but "situations" do not. A creature's ecological niche includes only those aspects of the physical surroundings that are relevant to its actions and activities. The same can be said about "situations." To borrow an example of the ecological niche from the evolutionary biologist Richard Lewontin (2000), two species of bird (phoebes and thrushes) live in exactly the same territory within the northeastern United States that includes both grasses and rocks, but whereas a phoebe's niche includes grass to build nests, a thrush requires rocks to crack open seeds. Rocks are physically present for a phoebe but go unnoticed; the same is true for grass and thrushes. For humans, the psychological situation includes only those aspects of the physical surroundings (or the nominal situation; Shoda, Mischel, & Wright, 1994) that are relevant to the goals of the perceiver, so that within the exact same physical surrounding there exist different "situations" for different people (or for a single individual at different points in time). This is the basic idea embodied in appraisal models of emotion. It is also consistent with the idea that the mind determines the "active ingredients," or psychological features, of the situation (Shoda et al., 1994; Wright & Mischel, 1988). There are features of the immediate physical surroundings that have significant meaning for some individuals (but not others) and that define their psychological niche. From this standpoint, a situation is not a description of the physical properties of the environment, but it can be characterized as containing just those aspects that are relevant to the thoughts, feelings, and behaviors of that particular person at that particular point in time. In effect, the mind determines the nature of the situation, so that a "situation" does not exist separately from the person. A personality might be thought of as the mind creating a psychological niche with some consistency (for a similar view, see Mischel, 2004).

Similarly, cultural environments exist by virtue of the people who constitute them. These individual perceptions create central cultural goals, or *models*. For example, not only are self-esteem-enhancing instances more readily recognized in American than in Japanese contexts, but they are also created more often. People praise each other more in American than in Japanese contexts, and all kinds of awards and trophies are created in American contexts (D'Andrade, 1984; Mes-

quita & Markus, 2004). On the other hand, self-criticism is ritualized and instantiated in Japanese contexts, where schoolchildren reflect on their mistakes of the day, and where criticisms are a prevalent part of daily conversations (Heine, Lehman, Markus, & Kitayama, 1999; Lewis, 1995). Similarly, in cultural contexts emphasizing harmony, relationships and interactions are often scripted according to detailed rules of politeness and social roles (Briggs, 1970; Cohen, 1999). These situations are extensions of the culturally shaped mind, and in turn shape it. No clear boundaries indicate where the mind stops and the cultural ecology of situations starts. Mind and culture mutually constitute each other (Shweder, 1991a).

Recent Developments of the Context Principle

The context principle is key to a powerful new intellectual movement that has emerged across many areas of psychology and cognitive science, termed *situated cognition* (Smith & Semin, 2004). This perspective critiques the older idea that behavior is explained by abstract inner information processing or computation, replacing it with a focus on the detailed, moment-by-moment interaction between an organism and its environment as the locus of explanation. For example, instead of postulating that humans and other animals construct detailed inner representations of the world around them to which they refer in making judgments or planning behavior, the situated cognition perspective holds that organisms rely on immediate perception of their surroundings to guide thought and action. Some situated cognition theorists have gone so far as to deny any role to inner representations (at least as conventionally conceptualized) in behavior. Like any broad intellectual movement, the situated cognition approach has had some clear victories but also faces intellectual challenges (see Smith & Collins, Chapter 7, this volume). The approach is one important reflection of the new emphasis on the role of context—the situation, the immediate environment—in the generation of behavior.

The context principle is also easy to identify in Larry Barsalou's highly contextualized view of the conceptual system (for reviews, see Barsalou, 2008, 2009; Barsalou et al., Chapter 16, this volume). Rather than viewing concepts as fixed, highly abstract entities, Barsalou's view is that conceptual knowledge is strongly situated (involving scenes, events, objects, actions, and mental states that go along with category exemplars). For example, people do not have one concept for the category named *anger*. They have a collection of concepts that can be associatively recombined in any number of diverse and flexible ways. For example, you have a concept of anger when another driver cuts you off in traffic, and

you yell and wave your fist; when a disobedient child breaks a rule and you calmly reexplain; when you hear the voice of a disliked politician and you turn off the radio; when a colleague insults you, and you sit very still and perhaps even smile; when you tease a friend instead of criticize; when you stub your toe and kick the kitchen table; and so on. Consistent with the view of situated cognition, the conceptual knowledge that is called forth in a given instance is tailored to the immediate situation, is acquired from prior experience, and may be supported by language.

Other Examples of the Mind in Context

In addition to the chapters in this volume, there are many empirical examples of the context principle at every level of scientific inquiry in psychology. For example, evidence has existed since the 1920s that emotion perception is influenced by contextual factors (for a review of these early papers, see Hunt, 1941). Knowledge of the social situation (Carroll & Russell, 1996; Sherman, 1927; Trope, 1986; Trope & Cohen, 1989), body postures (Aviezer et al., 2008; Meeren, van Heijnsbergen, & de Gelder, 2005), voices (de Gelder, Böcker, Tuomainen, Hensen, & Vroomen, 1999; de Gelder & Vroomen, 2000), scenes (Righart & de Gelder, 2008), or other emotional faces (Masuda et al., 2008; Russell & Fehr, 1987) all influence which emotion is seen in the structural configuration of another person's facial muscles (for a review, see de Gelder et al., 2006). Consider the fact, for example, that 60–75% of the time, people see facial depictions of fear as "angry" when they are paired with contextual information typically associated with anger (Carroll & Russell, 1996; for more examples, see Fernandez-Dohls, Carrera, Barchard, & Gacitua, 2008). Recent evidence indicates that perceivers routinely encode the context during emotion perception (Barrett & Kensinger, in press). People remembered the context better when asked to perceive emotion (either fear or disgust) in the face than when asked to make an affective judgment (either to approach or to avoid) about the face. The need to categorize the facial expression as an emotion required that perceivers use all information available to them—both the information contained within the structural configuration of facial muscles and that in the broader context.

Furthermore, emotion words provide a context for perceiving emotion in another person (for a review, see Barrett, Lindquist, & Gendron, 2007). When the influence of words is minimized, both children (Russell & Widen, 2002) and adults (Lindquist, Barrett, Bliss-Moreau, & Russell, 2006) have difficulty with the seemingly trivial task of using structural similarities in facial expressions alone to judge whether or not they match in emotional content (we say trivial because the face sets

used have statistical regularities built in). It is striking that 58% of the time, people have difficulty saying that two expressions of anger depict the same emotion, if they are neither provided any emotion words nor asked to generate them during the task (Lindquist et al., 2006). More recently, it has been shown that perceivers can detect small changes in the structural information that is available to distinguish one facial configuration from another, but they do not know which are psychologically meaningful in the absence of emotion words. When viewing morphs of chimpanzee expressions (structurally analogous to human emotion expressions), both experts and novices can detect perceptual distinctions all the way along the continuum, but without the influence of words, they do not prioritize specific distinctions as psychologically meaningful (Fugate, Gouzoules, & Barrett, 2009).

Emotion perception is not the only psychological process that is contextualized. The context principle is easily observed in other aspects of vision. Internal states influence visual perception. For example, when shown an ambiguous figure (e.g., a bistable image that could be seen either as a B or the number 13, or a horse-seal figure), people see whichever image is more pleasant for them (Balcetis & Dunning, 2006). A person's momentary affective state can also serve as a context to influence perception (for a review, see Barrett & Bar, 2009). Neutral faces are prioritized in consciousness when they invoke an affective state by being previously paired with negative gossip (Anderson, Bliss-Moreau, & Barrett, 2009). When a person is in a negative mood or in pain, hills appear to be steeper and distances seem longer than they really are (Stefanucci, Proffitt, Clore, & Parekh, 2008; Witt et al., 2008). Even physical exertion can make a hill seem steeper (Bhalla & Proffitt, 1999) or a distance seem longer (Proffitt, Stefanucci, Banton, & Epstein, 2003). When a person is standing on a high balcony, the perceived distance to the ground is correlated with a fear of falling (Teachman, Stefanucci, Clerkin, Cody, & Proffitt, 2008). Momentary behaviors also influence visual perception. For example, people using a tool to reach targets that are just beyond arm's reach see target objects as closer than when they intend to reach without the tool (Witt, Proffitt, & Epstein, 2005).

Currently active goals influence not only how people interpret a sensory array but also how they interpret and sample the sensory world in the first place (even when there is no overt shift of attention). For example, when viewing a hybrid face consisting of both high-frequency spatial information (depicting a happy woman) and low-frequency information (depicting a neutral-faced man), people sampled information differently depending on which sort of categorization task they were asked to perform. People asked to categorize the face as happy versus angry sampled high-frequency information and saw a happy woman. People

asked to categorize the face as expressive versus unexpressive sampled low-frequency information and saw an expressionless man (Schyns & Oliva, 1999). Goal-based sensory sampling can be observed even at the level of neurons in primary visual cortex (or V1). Perceivers who are asked to focus on and remember the color or orientation of a stimulus show different feature-specific activation patterns in V1, indicating that goal-based sensory sampling occurs at very early stages of visual processing (Serences, Ester, Vogel, & Awh, 2009; for another example of how goals influence feedforward color processing, see Zhang & Luck, 2009). In fact, within about 100 ms after stimulus onset, subcortical brain structures receive highly processed sensory input from the cortex; as a result, even the brainstem, midbrain, and thalamus cannot be considered solely bottom-up structures that respond merely to sensory information from the world (for a review on the implications for vision, see Barrett & Bar, 2009).

The physical environment also influences normal object perception (for a review, see Bar, 2004; Oliva & Torralba, 2007). For example, embedding blurred images of objects (e.g., an image of a toaster or a computer) in a congruent context (e.g., in a kitchen or an office, respectively) helps perceivers to see an object more easily than when they are placed in an incongruent context (e.g., a toaster in an office). Objects placed in an incongruent context are misrecognized as something that belongs to the context (Palmer, 1975). These effects occur not only because visual information in the context constrains what we expect to see and where we look (Chun, 2000) but also because the brain makes a prediction about what visual sensations refer to or stand for in the world based on past experience and future behavior (Bar, 2007).

Even neurons are subject to the context principle (see Sporns, Chapter 3, this volume). The information signaled by a neuron depends on the features of the external context. For example, a recent study with rats demonstrates a functional remapping of cells in the nucleus accumbens (part of the ventral striatum)—sometimes they code for reward and other times for threat, depending on the degree of negativity in the context (Reynolds & Berridge, 2008). The information signaled by a neuron also depends in part on the assembly of neurons that serve as the context in which it is firing. For example, a recent study in ferrets showed that individual neurons respond to different type of sensory cues when participating in different neural assemblies, even in primary sensory areas in which receptive fields for neurons are supposed to be well defined (as in V1; Basole, White, & Fitzpatrick, 2003). Other evidence indicates that motivational context influences the functional connectivity between brain areas. For example, neural responding is more tightly coupled in areas of early vision cortex (V1 through V4) when viewing

affective objects that are outside the focus of attention but have previously been paired with shock (and are more affectively significant) than when viewing objects that are neutral (Damaraju, Huang, Barrett, & Pessoa, 2009). Amygdala responses to emotional faces are influenced both by interpretive context (Kim et al., 2004) and by the amount of circulating stress hormone (Kukolja et al., 2008).

Nor is the context principle uniquely human (see Bouton, Chapter 12, this volume). As described earlier, rats do many things in "fear" (i.e., in the presence a threat). Other times they freeze. At still other times they escape. Sometimes they kick up their bedding in the direction of a threat (defensive treading).

The Context Principle Outside of Psychology

Although certain traditions within psychology have been concerned with the influence of context since its inception as a scientific discipline, the context principle is not specific to psychology. Biology, chemistry, and physics have all discovered the context principle. In biology, the importance of epigenetic factors in gene expression is only one example of the context principle. In chemistry, the context principle can be seen in the reactivity of *functional groups* (organic molecules or compounds). As molecular complexity increases, the context-dependent behavior scales accordingly, or maybe even in an exponential fashion. In physics, the paradigmatic example might be the theory of relativity. For many centuries, physicists struggled to comprehend time and space as absolute and unchanging entities—that is, until Einstein changed the terms of the questions entirely with his theory of relativity. Time and space are not rigidly independent categories; they are different ways of experiencing the same phenomenon, depending on the context.

THE PRESENT VOLUME

In psychology, if our field's task is mapping the various manifestations of the context principle, then the results might be similarly revolutionary. In this volume, we provide the interested reader with selected examples of how the external context (in the form of the physical, social, and cultural environments) configures with the internal context of the organism to produce the varied phenomena that make up the human mind (memories, emotions, behaviors, etc.). *The Mind in Context* contains 15 concise, forward-looking chapters that illustrate with empirical examples how the psychological phenomena of interest (from genes to personhood) emerge from the interaction between mind and context, while

emphasizing future conceptual and empirical directions. We also include a final chapter (Barsalou et al., Chapter 16, this volume) that integrates the chapters into an analysis of why the error of essentialism occurs and how better to represent and discuss the context principle. By looking across various research programs, and traversing levels of analysis, we hope to illustrate that the "context principle" is finally picking up some speed as a major theoretical force in psychology.

If the context principle is correct, then, as Dewey observed over a century ago, psychologists must abandon the linear logic of an experiment as a metaphor for how the mind works. In the classic experiment, we present a participant (be it a human or some nonhuman animal) with some sensory stimulation (what we call a *stimulus*); then we measure some response. Correspondingly, psychological models of the mind (and brain) almost always follow a similar ordering (stimulus → organism → response). Neurons are presumed generally to lie quiet until stimulated by a source from the external world. Scientists talk about "independent variables" because we assume that they exist separate from the participant. But outside the lab, the brain (not an experimenter) selects what is a stimulus and what is not, in part by predicting what will be important in the future. Said another way, the current state of the human brain makes some sensory stimulation into "information" and relegates the rest to the psychologically impotent "physical surroundings." In this way, sensory stimulation from the world only modulates preexisting neuronal activity but does not cause it outright (Llinas, Ribary, Contreras, & Pedroarena, 1998), and the human brain contributes to every mental moment whether or not we experience a sense of agency (and usually we do not). This means that the simple linear models of psychological phenomena that psychologists often construct will never really offer true explanations of psychological events. As demonstrated in this volume's chapters, the context principle offers a more promising approach to understanding the mind.

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NOTES

1. As this aspect of Wundt's work largely remains untranslated into English, it is necessary to rely on secondary sources.
2. Ironically enough, other social psychologists use these words exactly the other way around (Bruner, 1990; Markus & Kitayama, 2003). Regardless of what one calls what, the point is that there are physical movements out of which the brain creates (not detects) psychologically meaningful events.

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