

Perspectives on Culture and Concepts

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Annu. Rev. Psychol. 2015. 66:249–75

First published online as a Review in Advance on
September 17, 2014

The *Annual Review of Psychology* is online at
psych.annualreviews.org

This article's doi:
10.1146/annurev-psych-010814-015120

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Keywords

conceptual organization, language, folk theories, conceptual domains,
cultural epistemologies

Abstract

The well-respected tradition of research on concepts uses cross-cultural comparisons to explore which aspects of conceptual behavior are universal versus culturally variable. This work continues, but it is being supplemented by intensified efforts to study how conceptual systems and cultural systems interact to modify and support each other. For example, cultural studies within the framework of domain specificity (e.g., folkphysics, folkpsychology, folkbiology) are beginning to query the domains themselves and offer alternative organizing principles (e.g., folksociology, folkecology). Findings highlight the multifaceted nature of both concepts and culture: Individuals adopt distinct conceptual construals in accordance with culturally infused systems such as language and discourse, knowledge and beliefs, and epistemological orientations. This picture complicates questions about cognitive universality or variability, suggesting that researchers may productively adopt a systems-level approach to conceptual organization and cultural epistemologies. Related implications for diversity in cognitive science are discussed.

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INTRODUCTION

One could hardly imagine writing a cognitive psychology textbook without having a major section on concepts, but just a few decades ago it would not have been out of line to exclude any work on culture. Consider Medin & Smith's (1984) review of research on concepts. The only study involving cultural comparisons they cited was Eleanor Rosch's (1973) now classic study of color concepts among the Dani of New Guinea. Just 16 years later, cultural comparisons in studies of cognition and conceptual behavior were much more common, and a review by Medin et al. (2000) cited more than 30 cross-cultural or cross-linguistic comparisons. In this review, studies of culture linked closely to concepts have assumed a leading role—quite a dramatic change in 30 years.

There has been a corresponding substantial shift in the nature of and intentions associated with cultural comparisons. Traditional comparative approaches continue to receive consideration and play an important role, but they are being supplemented with new theoretical and methodological frameworks for understanding culture and cognition. In particular, changing conceptions of culture are feeding back to affect not only how culture is studied, but also how we understand the concepts recruited in such studies. Although a great deal of previous research focused on cultural similarities and differences in conceptual spaces (e.g., color terms, folk taxonomic systems, spatial cognition), the discreteness of these very domains is now increasingly under scrutiny. These developments, in turn, are affecting ideas about how culture should be conceptualized.

Our article is organized as follows. First, we provide a few observations on culture and concepts as background for our review. We discuss how cultural research continues to play a role in ideas

Culture: a way of life, often equated with shared knowledge or what one needs to know to live successfully in a community

about categories and conceptual behavior. This includes tests for generalizability across cultures as well as studies selecting different cultural groups on the basis of likely differences on some dimension or factor of interest.

Second, we point to several approaches to the study of culture and cognition, reviewing various sociocultural comparisons, interactions between language and thought, and domains of folkbiology, folkpsychology, and folkphysics. This body of research offers fertile ground for recent developments that extend the domain-specificity approach by examining potential cross-domain concepts and proposing novel organizations of conceptual domains themselves. Another viewpoint adopts a systems-level approach to understanding the interplay of culture and concepts and employs epistemological orientations as a framework for understanding how diverse cultural systems organize conceptual knowledge, values, and behavior.

BACKGROUND: NOTIONS OF CONCEPTS AND CULTURE

Concepts can take many forms and functions and thus may be defined in various ways (Barsalou 2008, Carey 2009, Medin et al. 2000, Solomon et al. 1999), including ways that influence roles for culture and culture's very definition (Brumann 1999). One influential view holds that concepts are the "units of thought" that form the building blocks of domain-specific folk theories (Carey 2009, p. 5; Gelman 2009). On this account, culture can be seen as input to domain-specific cognitive systems that structure learning (Gelman & Legare 2011). For example, empirical studies may compare how people from different cultures think about particular concepts (e.g., concepts of false belief, see Liu et al. 2008) or a series of related concepts (e.g., spatial terms, folk taxonomies). These results are then interpreted in terms of whether people across cultures share basic concepts and the extent to which those concepts are shaped by cultural inputs.

Other approaches take a more relational perspective on concepts, both with respect to how cultural systems (e.g., languages, artifacts, practices, values) affect conceptual organization and with respect to how concepts permeate cultural behavior (e.g., in the production of words or other artifacts). This includes work that emphasizes the distributed and contextualized nature of concepts as embedded in language and action (Barsalou et al. 2010, Cole 1998, Malt & Majid 2013). Empirical studies in this vein may investigate how distinctive conceptual patterns, such as spatial frameworks or agency attributions, emerge from the interaction between cognitive and social structures (see also Enfield & Sidnell 2014). From this perspective, culture and concepts are mutually constitutive processes rather than separate variables, leading to a more interactive view than the framework of cultural input and mental output suggests.

Complementary approaches treat concepts as embedded within cultural orientations that provide broad framework theories, also known as epistemological orientations, for organizing knowledge and behavior (Medin et al. 2013). For example, studies may focus on how epistemological orientations that view humans as part of nature (or apart from nature) influence conceptual organization and reasoning processes relative to the living world (Bang et al. 2007). This work takes a systems-level view in which culture affects both the contents and the processes of thought, a step that complicates the traditional separation between higher-level beliefs associated with culture (studied by anthropology) and basic cognitive functions associated with the mind (studied by psychology).

In a different but related vein, a great deal of research in cultural psychology aims to identify and systematically analyze domain-general systems of thinking that are typical of a culture (e.g., Nisbett et al. 2001). On these views, culture provides a generalized orientation to the world that influences cognitive processing across many domains, ranging from concepts and categorization to judgment, inference, reasoning, self-construal, and understandings of agency. Leading theories

Folkbiology: intuitive understanding of living things (plants and animals, including humans) in terms of biological processes and events

Folkpsychology: intuitive understanding of intentional agents' behavior in terms of mental states (thoughts, feelings, intentions) that drive actions

Folkphysics: intuitive or everyday understanding of physical events, bounded objects, and substances

Epistemological orientations: different ways of seeing the world; that is, broad cultural framework theories that provide skeletal principles determining what is considered worthy of attention and relevant to sense making and explanation

have focused on notions of self (Markus & Kitayama 1991), analytic versus holistic cognitive styles (Nisbett & Masuda 2003, Nisbett et al. 2001), individualist versus collectivist social orientations (Greenfield et al. 2003), and more recently high-context versus low-context (Kittler et al. 2011) and tight versus loose orientations (Gelfand et al. 2011). These approaches have in common a focus on potential conceptual diversity as one manifestation of pervasive cultural-psychological processes that determine global cognitive functioning.

In summary, different views of concepts and culture lead to different research emphases, questions, and methods. In our analysis, the goal is not to identify which views of culture or concepts are correct or even the best, but rather to examine the different kinds of contributions each view has to offer. The emerging consensus across these diverse approaches is that culture and conceptual behavior are inseparable.

POSITIONING CONCEPTS AND CULTURE: EMERGING TRENDS IN CULTURAL COMPARISONS

Given the consensus just described, it is not surprising that the interaction of cognition and culture is becoming increasingly important to cognitive science. Many scholars investigate potential universals linked to nativist, modular, or domain-specific views of cognition (e.g., Sperber & Hirschfeld 2004), whereas others seek to explore potential variability linked to the diversity of experiential and social interactions that contribute to mental life (e.g., Enfield & Levinson 2006). Consequently, one common concern across research programs is the question of what is universal or culturally variable in cognition. This question takes different forms at alternative levels of analysis—a set of differences at one level may become similarities at a more abstract level (Norenzayan & Heine 2005). We summarize three trends in cultural comparisons—changes in the units of comparison, a focus on neuroscience, and interdisciplinary collaborations. All three contribute to the diversity of perspectives relevant to culture and concepts.

If cultural cognitive research is growing by leaps and bounds, bear in mind that this dramatic increase in cultural research comes from a tiny base rate. The overwhelming majority of cognitive research, including research on the psychology of concepts, comes from samples of college students attending major research universities in Western, industrial, democratic countries—especially the United States (Arnett 2008). This focus continues despite evidence that these samples may be especially unrepresentative of people in general (Henrich et al. 2010). Some scholars suggest that Internet studies are a cure for this limitation, but Internet studies have problems of their own, including the observation that workers in these studies typically have participated in literally hundreds of other studies (Rand et al. 2014). Within the domain of concepts and conceptual behavior, college students, at a minimum, are atypical with respect to the basis for typicality effects and the use of categories in reasoning (Medin & Atran 2004).

Units of Cultural Comparisons

Comparisons can range from those on a global scale (e.g., East-West); to cross-national analyses; to within-nation cultural contrasts; or even to within-culture differences linked to socioeconomic class, religious affiliation, age, or gender. Although cross-national comparisons are the most common, significant cultural differences also distinguish groups within nations and societies (Stephens et al. 2014). Even within a relatively small geographical area, differences associated with socioeconomic class; rural, suburban, or urban lifestyles; and religion can be important to cognitive diversity. For example, consistent differences in self-construal and perceptions of agency are found between working-class and middle-class samples (reviewed in Kraus et al. 2012, Stephens et al. 2014). In terms of residency, Rhodes & Gelman (2009) reported substantial differences between

US Midwestern rural and suburban samples in tendencies to essentialize race and gender, and research in folkbiology finds different developmental trajectories for urban, suburban, and rural children (Coley 2012, Coley & Tanner 2012, Herrmann et al. 2010). There are also differences in conceptions of evolution associated with different religious orientations within the United States (Evans 2001).

A small but growing body of research explores how cognition interacts with lifestyle differences across non-Western, small-scale societies (Uskul et al. 2008). For instance, hunter-gatherer and farming communities differ in patterns of child development and parenting (Hewlett et al. 2011). Echoing trends found in the United States, folkbiological reasoning also differs between indigenous individuals who reside in traditional rural settings and those residing in modernized town settings (Shenton et al. 2011).

The majority of cultural studies involve between-group comparisons and are not geared to explore within-group differences. Yet attention to within-group variation may offer insight into the distributed, evolving nature of cultural knowledge. One way to explore such variation is through cultural consensus modeling, which measures the degree to which individuals share a consensus within a domain (Romney et al. 1986). Such analyses can reveal nuanced variations in mental models that inform theories of conceptual knowledge: For example, men and women in Guatemalan Ladino communities make different inferences about specific ecological relations between forest-dwelling animals and plants, suggesting that folkecological models are linked to gendered expertise (Atran & Medin 2008, p. 216). Likewise, within-group variation in folkecological knowledge can be traced along intergenerational lines (Le Guen et al. 2013).

Intriguingly, coherent between-culture differences may not be accompanied by a corresponding patterning of within-culture differences at the individual level (Na et al. 2010). That is, relationships that distinguish between cultures at the group level (e.g., individualistic orientations are linked to low-context reasoning and collectivistic orientations to high-context reasoning) need not and do not similarly distinguish related differences among individuals within those cultures (i.e., among Westerners, more individualistic people are not also lower-context thinkers). This observation offers a perspective different from studies that link individuals' cognitive measures (e.g., contextual information produced in drawings) and their cultural styles (e.g., cultural tests of context sensitivity) on the expectation that culture-level differences found between groups will also predict individual differences within groups (Istomin et al. 2014). Further research is needed to clarify the (sometimes counterintuitive) interrelations of cultural and cognitive orientations at these different levels of analysis. So far, the general lesson from this growing body of research is that culture and concepts involve multiple, correlated dimensions that vary with different forms of subsets of larger groups (e.g., religion, residency, class), all of which can be expected to interact in complex ways.

Culture and the Brain

Recent reviews have highlighted cultural influences on cognition across multiple levels of analysis, from neuroscience and embodiment to higher-order cognition (Kitayama & Uskul 2011, Seligman & Brown 2010). Some new approaches argue that culture may be embraided in neurological pathways through repeated behavioral practices for a hard culture-mind interface that is not always mediated by soft cognitive mechanisms (Chiao & Immordino-Yang 2013, Han et al. 2013, Kitayama & Uskul 2011). In short, culture may wire the brain (Park & Huang 2010).

Neuroscience studies increasingly offer support for this view. For example, localized neural activation associated with attention to contextual information is more pronounced for Chinese than for American participants while making physical causal judgments, in line with holistic or

Folkecology:

intuitive understanding of interactions among plants, animals (including humans), inanimates (soil, rocks), and dynamic processes (weather and water systems)

analytic reasoning styles (Han et al. 2011). An emerging body of work is revealing a patterning of differences in brain activation on various cognitive and perceptual tasks across culture and age (e.g., Park & Gutchess 2006, Reuter-Lorenz & Park 2010). More broadly, researchers propose that the causal relations among brain, body, and culture are multidirectional, such that different patterns of neural activation and psychophysiology may form the basis of, and be caused by, embodied cultural practices (Seligman & Brown 2010).

Interdisciplinary Collaborations

Interdisciplinary teams are changing the kinds of questions asked and the data brought to bear on cognitive questions. The present template for these collaborations was set by economists and anthropologists interested in studying decision making involving economic games across cultures (Henrich et al. 2005, House et al. 2013).

Interdisciplinary collaborations have made notable contributions to experimental philosophy, causal cognition, and folkpsychology. Philosophers are using empirical studies to investigate philosophical intuitions among ordinary folk, such as the distinction between the concepts of knowing versus believing that is critical to epistemology, with the result that intuitive principles that were previously presumed universal are now suspected to vary as a function of culture, socioeconomic status, and gender (Buckwalter 2012, Buckwalter & Stich 2014, Weinberg et al. 2001). Related work addresses folk concepts of intentionality and morality (Knobe & Burra 2006, Knobe et al. 2012, Sarkissian et al. 2010).

Another project has brought together anthropologists, linguists, psychologists, and philosophers to study causal reasoning across cultures (Bender & Beller 2013). One significant result of the collaboration has been heightened attention to social dimensions of causal reasoning (Bender & Beller 2013, Stenning & Widlok 2013, Whitehouse 2011). For example, people may engage in rituals to achieve an instrumental physical outcome (e.g., curing an illness), but they do so in ways that reflect normative, social causal frameworks (e.g., establishing relationships with forces of good) (Whitehouse 2011). Another example comes from hunting: The San of Namibia hunt termites using methods based on social causation geared toward seducing the termites and taking their perspective to predict where they will emerge; in such cases, physical causal reasoning seems inadequate to describe people's conceptual behavior (Stenning & Widlok 2013). Finally, another major interdisciplinary project has studied morality, folkpsychology, and artifacts with a focus on the cognitive and evolutionary foundations of culture (House et al. 2013, Laurence 2014).

Proponents of a more interdisciplinary cognitive science have argued for the benefits, even the necessity, of bringing multiple perspectives to bear on cognitive questions (see special issue in Bender & Beller 2011b). Many projects have adopted the strategy of running standard psychological tasks with samples around the world (e.g., Barrett et al. 2013, Henrich et al. 2005), but interdisciplinary diversity can also be leveraged to challenge the research process itself. Given that psychological research and theory tailored to Western samples tend to limit the framework of cultural investigations to Western norms and problems (Medin et al. 2010), a critical advantage of multidisciplinary and multicultural teams is their ability to formulate new (or revised) starting points for theory and methods concerning concepts (Medin & Bang 2014). This challenge remains a vital one, as the research reviewed below attests.

Summary

These advances in cultural comparisons contribute new perspectives to the science of culture and concepts, many of which are highlighted in this review. With this nuanced view of culture in

mind, the stage is set for considering conceptual behavior from multiple cultural perspectives. We begin with the notion of concepts themselves, exploring their status as units of thought from a cross-linguistic perspective.

CULTURE, LANGUAGE, AND CONCEPTS

A large body of research takes advantage of language differences by trying to trace their cognitive consequences (or antecedents) (see edited collection in Malt & Wolff 2010). In the following section, we highlight cross-linguistic research that analyzes how words can speak to the nature of concepts. Introducing language in terms of cognitive consequences or antecedents implicitly construes the relationship between the two as ordered, from cause to effect. These causal influences have been hotly debated since Whorf [1956 (2012)] introduced the idea of linguistic relativity, which holds that the language we speak determines the concepts we think. Today the debate is often reframed as a system of mutual influence in which concepts and language reciprocally interact (Fausey et al. 2010).

Word-Concept Mappings: Cross-Linguistic Perspectives

Relations between language and concepts traditionally have been explored through documentation of semantic fields such as ethnobiological classification terms (Berlin 1992, Berlin et al. 1974) or spatial lexemes. Such approaches assume that word-concept mappings are fairly direct, by identifying single lexical items (e.g., the word “dog”) with concepts (the concept DOG)—an idea still important in psychology (e.g., Carey, 2009), especially for object concepts (Waxman & Gelman 2009). Recent linguistic studies offer a more complex view of word-concept relations (Malt & Majid 2013, Malt & Wolff 2010, Malt et al. 2014, Sauter et al. 2011).

In a study of human locomotion terms, Malt et al. (2008) analyzed how speakers of four languages (English, Spanish, Dutch, Japanese) assigned words to various forms of human locomotion (e.g., jumping, hopping) depicted in action videos. Of interest were not only individual word-action mappings, but also the way that words from different languages might cluster around (potentially shared) dimensions of movement. On the first point, languages did mark movements differently at the level of single lexical items such as “jumping” versus “hopping” (note that such lexical items might be identified as concepts under common psychological methods). On the second point, however, multidimensional scaling showed that all four languages tracked similar discontinuities in locomotion corresponding to biomechanical and speed/aggressiveness dimensions of movement. Importantly, this shared conceptual space did not map precisely onto the words of any single language. On the basis of these and other findings, Malt et al. (2014) proposed that concepts do not represent stable sets of features but instead track dimensions of thought “experienced as a coherent grouping” (p. 37).

One way that language influences categorization is through linguistic features such as classifiers used to mark kinds of things by shape, number, or other features. These classifiers may influence preferred categorization strategies simply due to shared linguistic structure rather than presumed conceptual structure. For example, German and Chinese children’s categorization and induction strategies follow either taxonomic or thematic patterns depending on the linguistic classifiers for the task items (Imai et al. 2010). This finding undermines more sweeping claims about culture-wide East-West differences in thematic versus taxonomic conceptual styles. As Imai et al. (2010) observed, categorization behavior is only one index of conceptual structure that should be contextualized in a global picture of cognition that includes multiple constraints on conceptual behavior.

In summary, studies on the interaction of words and concepts across cultures refine claims about cultural cognitive styles based on any given task or set of (language-specific) words. Broadening the range of concepts examined and highlighting the shifting nature of at least some types of categories and concepts lend a nuanced view to the interaction of culture and conceptual strategies. Systematic cross-linguistic studies are critical to understanding the range of variation in conceptual systems. As Malt and colleagues (2013) caution, “It seems impossible to discern from only a single language what the shared elements will be and which parts of the patterns are idiosyncratic to the language” (p. 31).

Linguistic and Conceptual Diversity Across Cultures

Whereas locomotion terms differ lexically but converge on common conceptual dimensions, researchers have argued that there are other domains in which languages reflect basic conceptual divergence (Evans & Levinson 2009). Studies in this field are generally motivated by the question, If languages have different words, do their speakers possess correspondingly different concepts? There are at least two possibilities. Despite surface variation, all languages may share underlying concepts. If concepts share universal structure, this could imply that languages will too—that is, that humans will categorize and name the biological world in ways that track “beacons on the landscape of biological reality” (Berlin 1992, p. 53). Another view holds that linguistic systems are shaped by local communicative and social constraints (Evans & Levinson 2009) and that properties of language are as variable as the diversity in human social systems.

Language may affect how people construct notions of agency (Fausey & Boroditsky 2011, Fausey et al. 2010). Linguistically, there are different ways to mark agents involved in intentional versus accidental events. English allows speakers to specify the agent who caused an accidental event (“she broke the vase”), but Japanese and Spanish tend to omit the agent in such cases (“the vase broke”). Recent evidence suggests that these linguistic differences affect eyewitness memory for agents involved in accidental events. Compared with English speakers, Spanish and Japanese speakers are less likely to remember the agents involved in accidental, but not intentional, events (Fausey & Boroditsky 2011, Fausey et al. 2010).

Another set of investigations looks at how language influences sensory experience and associated concepts (see special issue, introduced by Majid & Levinson 2011). This work refines universalist claims about human sensation by showing how diverse languages facilitate differing modes and degrees of sensory discrimination. For example, although it was long thought that humans (represented by English speakers) are poor at discriminating odors, recent work undermines this generalization (Majid & Burenhult 2014). Compared with English, the Jahai language has many olfactory names, and its speakers are substantially better than English speakers at discriminating unfamiliar odors.

Researchers have argued that language reflects variable concepts associated with other domains such as time perception (Núñez & Sweetser 2006) and spatial reasoning (Haun et al. 2011) (but see Li et al. 2011). Spatial reasoning represents one domain in which researchers have gone beyond singular, lexicalized notions of concepts to focus on language as one component of a system that also includes gesture, metaphor, ideology, and worldview. A growing body of findings demonstrates that people’s preferred spatial frameworks (coordinate systems for referring to location and direction) may reflect cultural factors rather than language per se. For example, Yucatec Maya children gesture with absolute (cardinal) directions before they learn Maya spatial reference terms (Le Guen 2011), so spatial frameworks are not exclusive products of language.

Other researchers propose that conceptual frameworks for space may conform to ideological rather than linguistic constraints (Núñez & Cornejo 2012). This claim derives from an analysis of

the origins of a unique linguistic phenomenon among the Aymara of the Andes. When Aymara speakers describe things in space, they use an absolute frame but encode it with intrinsic lexemes. For example, “in back/front of” can and is used for “west/east of.” This intrinsic-for-absolute encoding is cognitively robust, expressed in spontaneous cospeech gesture, Andean Spanish, metaphors, and urban layouts. But critically, the Aymara language has words corresponding to “east” and “west.” Why then do Aymara speakers use the intrinsic terms for “back” and “front”? The authors point to the Aymara worldview, which perceives the entire community as part of nature, a social system that is canonically oriented toward and faces the sunrise. Thus, Aymara do not use absolute (east-west) terms to describe their spatial layout because doing so “would portray an empty meaningless land, deprived of its constitutive humanity” (Núñez & Cornejo 2012, p. 24).

Domain specificity: the view that concepts are structured by specialized cognitive capacities tied to particular content domains or causal principles

Summary

Recent investigations suggest that concepts are products of multiple cultural systems that include linguistic, sensory, and ideological components, among others. Just as concepts interact with language, language itself is situated within and responsive to cultural forces.

DOMAIN SPECIFICITY

Significant bodies of work have explored how conceptual thought and development are organized in terms of domain-specific theories and causal principles (Carey 2009, Sperber & Hirschfeld 2004, Wellman & Gelman 1992). In this view, concepts are structured and constrained by intuitive causal-explanatory frameworks tied to the particular ontological domains of folkphysics, folkbiology, and folkpsychology (Keil 1995, Wellman & Gelman 1992). The following section reviews cultural research addressing concepts from the vantage point of these domains (including work by proponents of both domain-specific and domain-general perspectives). Much of this work reflects a developmental orientation (see Keil 2007).

Folkphysics

Experience of the physical world seems relatively direct and unmediated (compared with the social world), so it is not surprising that naïve physics or folkphysics (knowledge about physical objects and events) traditionally has been assumed to be largely independent of cultural influence. This view is being reexamined in light of research documenting both within-culture and cross-cultural variations in conceptions of physical interaction.

The well-known studies of Morris & Peng (1994) focused on East-West differences in the perception of social causality, where the lack of cultural differences in the perception of physical causality acted more or less as a baseline or control condition. But just a few years later researchers began to explore the hypothesis that East-West differences in causal attributions extend also to nonsocial, physical events (Nisbett et al. 2001, Peng & Knowles 2003). On this account, Eastern folk theories of physics should emphasize external, relational factors in causal determination of physical events (in line with their collectivist orientation), and Western folk theories should emphasize dispositional factors of the object (in line with their individualistic orientation).

As predicted, when asked to interpret ambiguous physical events such as a round object bobbing on a surface, Chinese participants saw the event as attributable to the relation between object and medium, whereas US participants attributed causality to the properties of the object itself. These results suggested that folk theories of physics are open to cultural influence, including, as Peng & Knowles (2003) found, cultural forms of knowledge acquired through physics education.

Recent findings extend and complicate this view. In one series of studies involving similar judgments about floating (Beller et al. 2009, Bender & Beller 2011a), German and Tongan informants were asked about physical interactions with probes that varied contents, entities, and linguistic construction. Replicating what would be expected on the individualistic-collectivistic paradigm, Germans (a more individualistic society) tended to attribute prime causality to the floater object, while Tongans (a more collectivistic society) attributed causality to the medium. Importantly, however, these cultural patterns were modulated by task content and linguistic agency construction (Bender & Beller 2011a).

Furthermore, analysis of individual response distributions within a culture complicates the generalizations that can be drawn about causal reasoning styles (Bender & Beller 2011a). Given that each participant in the study above saw nine event scenarios, their overall attribution profile could reflect either a balanced causal attribution pattern (equal number of assignments to objects and carriers) or an asymmetric causal bias (strongly favoring either object or carrier). On average, Tongans looked less biased toward causal asymmetry than Germans did. But the Tongan response distribution was in fact bimodal, with most informants giving either a consistent carrier or object attribution profile (and the majority preferring the former). Individual Germans, in contrast, tended toward a less extreme but more consistent object-bias attribution pattern. Thus, Tongan informants presented even stronger asymmetric causal bias in physical attributions than Germans did, in direct contrast to what would be predicted for a collectivistic society that attends to relational context. This finding underscores how individual response patterns within cultural groups are critical to making sense of conceptual orientations.

Other research focuses on the complexity of causal beliefs in the physical domain (reviewed in Spencer-Rodgers et al. 2010). This work finds that, across both physical and nonphysical domains, East Asians tend to mobilize a larger set of causal antecedents and consequences for events than Westerners do. This is known as the ripple effect (Maddux & Yuki 2006). When considering a shot in a game of pool, for example, East Asian participants were more likely than Western participants to say it would impact both immediate and distant future shots (e.g., the sixth shot), reflecting a focus on indirect, distal consequences of events. These beliefs also influence causal reasoning processes, as when East Asians consider a broader array of factors as relevant to causal attribution than do Westerners (Choi et al. 2003, Koo & Choi 2005). Another aspect of causal complexity concerns beliefs about change across time, with East Asian children and adults holding expectations of cyclical change (linked to naïve dialecticism) and Westerners tending to expect linear change (Ji 2008, Ji et al. 2001).

To summarize, research on physical causal reasoning demonstrates that cross-cultural comparisons are necessary to test the generalizability of cognitive phenomena. For example, the causal asymmetry bias has long been seen as a signature feature of human causal cognition (Michotte 1963, White 2006), much as the fundamental attribution error was once seen as a natural feature of social reasoning (Morris et al. 1995). However, cultural research shows that the asymmetric bias can be stronger or weaker, and even reverse directionality, depending upon one's cultural folk theories.

More broadly, research on folkphysics speaks to important questions about concepts and culture. Cultural diversity may emerge in patterns of frequency rather than categorical differences: Individuals in all cultures may have access to multiple causal theories and appear to access these modes selectively in response to contextual demands. Given that culture encompasses many factors—including language, education, philosophical orientations, and social norms—that potentially influence causal cognition in multiple directions, it is inadequate to treat culture as a monolithic construct that determines “one coherent pattern” of causal cognition (Bender & Beller 2011a, p. 2).

Folkbiology

People's understanding of life is encompassed by folkbiology. Biological thought may involve multiple causal frameworks (vitalism, teleology, essentialism) for understanding life across multiple scales, including adaptation (evolution), life cycles (birth, growth, death), and organism functioning (illness, organs). Cultural research has been conducted on all these topics, but here we focus on research addressing understandings of nature and folkbiological knowledge of nonhuman animals and plants.

Central to folkbiology are the concepts of life and animacy, including how these concepts are organized in relation to one another. Are humans animals? Are plants alive? For children, the answer to both questions often is no. Reasoning about these conceptual questions varies across development (Opfer & Gelman 2001, 2010) and across cultures, influenced by language, experience, and cultural beliefs about living kinds. With regard to language, Indonesian and US children's early reasoning about the living things category is influenced by their language's naming practices that either include (English) or exclude (Indonesian) humans from the semantic category of animal (Anggoro et al. 2010). These language differences also extend to parent-child discourse about human-animal categories in naturalistic settings, even though parents in both cultures rarely talk about humans as animals (Leddon et al. 2011). This shared habit of discourse across two different languages, taken together with the finding that linguistic influences on children's categorization attenuate with age (Anggoro et al. 2010), suggests that biological reasoning is influenced by factors other than language alone, including cultural orientations to the natural world and experience (Tarlowski 2006, 2011).

Research on the concepts of alive and animate within the Wichí community of Argentina illuminates the multifaceted nature of these concepts (Taverna et al. 2012, 2014). For both children and adults, the concept of living thing branches according to distinctive linguistic construals and cultural beliefs. The primary construal for the word "alive" taps into the set of animate things (i.e., excluding plants) believed to have vital spirits, and this pattern holds even for Wichí adults, thus diverging from Western adult populations. In contrast, the primary construal for the word "die" taps into the set of all living things (i.e., including plants). One way to interpret these findings is that Wichí approach the concept of living thing through multiple perspectives.

Complementing this work on individual concepts, other cultural investigations have begun to explore the broader conceptual frameworks for organizing folkbiological knowledge (see Erickson et al. 2010). Although broad similarities in folk taxonomic categories are now well documented cross-culturally (Atran & Medin 2008, Berlin 1992), there is considerable cultural divergence in how knowledge about these categories is organized (Levin & Unsworth 2013). Depending on their culture and expertise, individuals tend to privilege either taxonomic similarities (e.g., European American individuals) or ecological relations (e.g., indigenous individuals) when reasoning about biological phenomena (Medin et al. 2006). These differences between Native American Menominee and European American rural communities have been replicated with young (five- to seven-year-old) children (Unsworth et al. 2012). For example, when describing relationships among natural kinds, children from both groups used habitat relations, but Menominee children were reliably more likely to mention relations involving food chains (e.g., the stink bug might eat the leaves of the berry bush) and biological needs (e.g., both need water, sunlight, or soil).

Another critical theoretical question concerns the proposition that the initial organizing framework for folkbiological concepts is human centered. One influential theory proposed a universal conceptual trajectory whereby children first reason about folkbiology from an anthropocentric

standpoint (Carey 1985). This notion is consistent with the claim that folkbiology is initially a part of folkpsychology and only emerges as a distinct domain with development.

Support for Carey's view came from studies showing that urban five-year-old children in the United States tend to treat humans as the prototype for inductive reasoning about biological kinds. That is, they were more likely to extend a novel property to other animals when it was attributed to humans than when it was attributed to dogs. They also generalized from humans to dogs much more than from dogs to humans.

Subsequent studies using Carey's procedure with rural indigenous (Menominee) and European American children showed no evidence of a human-centered biology (Waxman & Medin 2007). One possibility is that a human-centered biology is a learned cultural model driven partly by anthropomorphic images in children's films and books. An alternative conjecture is that all children go through a human-centered stage of development but that rural children just go through it sooner.

Resolution to this question came from a study showing that urban three-year-old children do not yet adopt a human-centered perspective, but that four- and five-year-olds do (Herrmann et al. 2010). Thus, the anthropocentric pattern of reasoning is an acquired cultural perspective, one that emerges between three and five years of age in US children raised in urban settings and one that can be primed by media directed at children (Waxman et al. 2014).

In summary, even basic concepts such as alive can shift as thinkers adopt different perspectives afforded by their language, cultural beliefs, media, or orientations to nature. It appears that the most salient effects of culture on biological cognition are less in terms of individual concepts and more in terms of framework theories that, for example, see humans as a part of or apart from nature or foster a taxonomic versus an ecological conceptual organization.

Folkpsychology

Understanding others in terms of minds and mental states is known as folkpsychology. Folkpsychological concepts have assumed a central role in several interrelated research areas, including theory of mind, mind perception, and morality (see reviews in Waytz et al. 2010, Wellman 2010). Following an important review of culture and folkpsychology almost 20 years ago (Lillard 1998), there has been steady empirical research and interdisciplinary conversation on these topics (Danziger & Rumsey 2013, Luhmann 2011). We begin with a synthesis of cultural patterns from the large literature on standard theory-of-mind tasks and then consider how these mental-state concepts are organized and situated in larger contexts of knowledge.

Theory of mind involves several interrelated concepts, including the understanding that people can hold false beliefs about reality (false belief), that knowledge depends on perceptual access (knowledge access), that people have different opinions and beliefs about the world (diverse desires and beliefs), and that people sometimes hide their true emotions from others (hidden emotions) (Wellman & Liu 2004). One particular task, the false-belief task, is widely considered the definitive test of theory of mind (Wellman et al. 2001).¹ In most versions of the task, one character puts an object in Container A and leaves the room, at which point the object is moved by a different

¹Given that the cross-cultural research has focused on theory-of-mind development in early childhood, verbal measures are the focus of this discussion. Other research shows that infants have expectations about an ignorant actor's initial search location in false-belief tests, as inferred from infants' looking-time patterns (Onishi & Baillargeon 2005, Senju et al. 2011). How infant capacities relate to later-developing theory of mind is debated; regardless, claims for universal cognitive capacities will also need to consider the range of cultural diversity that appears beyond infancy, as reviewed here (even as assessed by looking-time measures; see Barrett et al. 2013).

actor to a new location, Container B. When the first character returns to the room, participants are asked, “Where will she look for the object?” or “Where does she think/believe it is?” Young children incorrectly say she will look in the true location (Container B); but by three to five years of age most US children appreciate that she will look in Container A because she does not know the object has been moved. In passing this task, children demonstrate appreciation of the critical insight that mental states can diverge from reality and that they are linked to perception and behavior (Flavell et al. 2002).

By now, many cross-cultural comparisons have been conducted using standard theory-of-mind tasks (which were developed for use among Western research populations and therefore are potentially tailored to these same populations). Most of these studies simply aim to test theory-of-mind generalizability (where the more different the groups, the stronger the test), but a few assess specific predictions about local theories of mind. The results reveal a somewhat mixed picture whose interpretation varies across researchers (e.g., Wassmann et al. 2013).

On the one hand, children and adults in many cultures perform successfully on standard tasks, as demonstrated by extensive survey studies comparing children across multiple large-scale societies (e.g., Callaghan et al. 2005, Shahaian et al. 2011, Wellman et al. 2001). On the other hand, some studies among small-scale societies report that children pass false-belief tasks at ages slightly later but roughly comparable to those observed among Western children, including communities of Micronesia (Oberle 2009), Cameroonian Baka (Avis & Harris 1991), and Yucatec Maya (Knight et al. 2004). These profiles of similarity are often taken as evidence that basic mental-state concepts are universal and reflect an invariant foundational framework theory for later-developing cultural folkpsychologies (Wellman et al. 2011).

Against this broad consensus, three major forms of cultural variability can be identified from recent studies. The first can be characterized as quantitative, concerning age variation. In comparative studies, children from non-Western or small-scale communities sometimes appear delayed relative to otherwise consistent cross-cultural trends (e.g., Callaghan et al. 2005; Mayer & Träuble 2013; Naito & Koyama 2006; Vinden 1999, 2002). For example, one study of children’s false-belief performance among five cultural groups (Euro-Canadian, Indian, Peruvian, Samoan, and Thai) reported a common false-belief milestone at roughly five years of age, with the exception that Samoan children evidenced considerable delays (Callaghan et al. 2005). A recent follow-up study with more than 300 Samoan children found that false-belief understanding did not reliably emerge for the majority of children until 8 years of age, and even then, one third of 10- to 13-year-olds still failed the task (Mayer & Träuble 2013). These are huge differences compared to the four- to five-year landmark reported for children in Western societies.

Another framing of this trend is to say that Western children appear oddly advanced relative to children the world over. Indeed, in studies comparing Mofu, Tolai, Tainae, and Western children, Western children were the only ones at or near ceiling on all four theory-of-mind test questions by age six. In other communities, comparable levels of success were not achieved until anywhere from 7 to 15 years of age (Vinden 1999, 2002). Lacking broader investigation of children’s folkpsychological understanding in these diverse societies, it is difficult to interpret such age differences—seeing their development as delayed seems to adopt a deficit model that may well be ethnocentric.

A second, more qualitative source of variability is seen in children’s developmental trajectory for mastering specific tasks (e.g., Shahaian et al. 2011; Wellman et al. 2006, 2011). For example, Chinese and Iranian children understand concepts of knowledge access earlier than opinion diversity, an order reversed for Australian and US children. These developmental differences are clearly not delays but rather suggest distinct sociocultural influences on cognitive development. One hypothesis is that the two sequences reflect collectivist versus individualist cultural orientations, which

differentially emphasize the value of personal beliefs and knowledge acquisition (Shahaeian et al. 2011). Still, these researchers interpret their results as evidence that “cross-cultural variations exist within broadly culturally consistent, if not universal, patterns” (Shahaeian et al. 2011, p. 1,245).

A third source of variability comes from categorical differences in theory-of-mind task performance. Several research projects with youth in small-scale communities have failed to produce expected results using standard theory-of-mind tasks. For example, one recent study reported standard outcomes for false-belief understanding from three small-scale societies, but results from a fourth field site in Kenya were not included because these children (no ages reported) did not show the expected preferential-looking patterns on false-belief tasks (Barrett et al. 2013). Similarly, false-belief tasks could not be administered with children from a Junín Quechua community of Peru, apparently due to different understandings of the task itself (Vinden 1996).

Explaining cultural variability in theory-of-mind performance is a challenge. Some researchers point to methodological issues, including children’s unfamiliarity with task contents, experimental settings, or shyness with adult researchers (e.g., Knight et al. 2004). Other investigators suggest that children attend to, or perhaps interpret, the false-belief task differently. For example, with regard to the failed administration of a false-belief task in Kenya, these children may have been attending to “the social demands of the testing situation rather than to the task itself” (Barrett et al. 2013, supplementary materials S.6, p. 27). The current consensus appears to view all three sources of variation as modest and methodological.

But a minority voice argues that observed cultural differences point to a more basic diversity in conceptions of the mind and mental world. In Samoa, for instance, children’s delayed false-belief understanding may reflect local conceptions about the “opacity of other minds” (Mayer & Träuble 2013), associated with the practice common to Oceanic communities whereby people refrain from explicit discussion of others’ mental states (Robbins & Rumsey 2008).

An important contribution to this literature comes from research programs that explore how folkpsychological concepts are organized by conceptual frameworks and everyday practices. For example, attention to internal mental states is prized in Western middle-class contexts, where talk about mental states is found to enhance theory-of-mind development (Doan & Wang 2010). In contrast, attention to social situations, external actions, and context are emphasized in Chinese culture, and Chinese children advance in false-belief understanding through talk about others’ actions rather than mental states (Lu et al. 2008). These findings point to the potential significance of variable mental-state language and discourse across cultures (Danziger & Rumsey 2013, Goddard 2010).

Another approach to folkpsychological concepts analyzes how children’s concepts of minds and mental states are learned via social testimony (Harris & Koenig 2006). For example, in Western communities, children gradually learn from social testimony to construct a metaphor of the brain as a container for thoughts, and to discriminate the brain’s role in psychological processes from common metaphorical allusions to the heart, gut, and other peripheral body parts (Gottfried & Jow 2003, Winer et al. 2009).

Comparable studies of social testimony about the mind in other cultures are rare, but ethnographic reports suggest that they would be informative (Luhrmann 2011). Related research explores how mental-state concepts organize everyday practices and knowledge in adjacent domains, including morality (especially concepts of intentionality) (Lee & Evans 2013, Sachdeva et al. 2011) and emotional states (e.g., Lim et al. 2010). These approaches help situate specific mental-state competencies (e.g., false belief) within larger conceptual frameworks. The next step might be to develop theory and methods that can assess how folkpsychological concepts are organized differently across cultures, and to explore what other competencies may be privileged indicators of social-cognitive understanding among children in small-scale, non-Western societies.

Summary

Discussions of universality and variability in domains of folkphysics, folkbiology, and folkpsychology have highlighted diverse perspectives on concepts. One lesson from this research is that basic concepts such as physical cause, living kind, or mind are construed in different ways depending on perspectives afforded by context, language, knowledge, social testimony, and cultural orientations. Diverse cultural folk theories may serve to selectively highlight distinct aspects of events or things in the world while deemphasizing others, yet still be based on a common foundation for discriminating those core phenomena (e.g., Peng & Knowles 2003, p. 1,283). For instance, cultures may differ in their focus on either the internal mental aspect or the external relational aspect of folkpsychology, but both cultural orientations afford “pathways for theory of mind development” that support social-cognitive competency (Lu et al. 2008). One important implication is that conceptual frameworks are intrinsically pluralistic, which brings us to the next topic of discussion.

Cross-domain interactions:

concepts and causal principles that involve mappings across domains of folk knowledge

EXTENDING DOMAIN SPECIFICITY

Essential to domain specificity is the proposal that unique causal principles and explanatory theories guide understanding of physical, biological, or psychological events. Yet a growing body of research shows how physical, biological, and psychological knowledge interact at the levels of concepts, explanatory frameworks, and novel folk theoretical perspectives.

Conceptual Domains at the Intersections

Researchers are now beginning to ask what happens at the intersections of domains, with many inquiries organized around two motivating observations: (*a*) Everyday concepts often involve cross-domain interactions, raising questions about conceptual integration across domains; and (*b*) people readily reason about events in terms of multiple, different kinds of causes, pointing to the potential fluidity of explanatory frameworks.

Cross-domain concepts: the case of psychophysical dualism. Cultural ideas associated with concepts of mental-physical dualism have generated a great deal of interest (Bloom 2005, Cohen 2007, Cohen et al. 2011, Hodge 2008, Slingerland & Chudek 2011, Wellman & Johnson 2008). The primary question concerns how people reason about the interactions of psychological events with biological or physical events. For example, people may believe that biological events such as heart attacks are linked to psychological causes, or that depression has both physical causes and consequences. At first glance, such beliefs may seem to complicate the dualistic distinction between mind and body.

Illness beliefs have been an informative site for investigating cross-domain mind-body concepts. Many illnesses include psychophysical events (e.g., stomachaches) that involve both biological and psychological factors. Given this cross-domain aspect, people might conceptualize such events in at least two distinct ways. Some research offers evidence for an intuitive cognitive division between psychological and biological causes (reviewed in Gelman & Noles 2011). For example, three- to five-year-old children in the United States are less likely to construe cross-domain psychological (versus within-domain biological) factors as causally related to events such as stomachaches (Schulz et al. 2007), and similar patterns are reported for Japanese preschool children (Toyama 2010).

But the tendency to keep psychological and biological causes separate may vary with cultural perspectives. For example, Lynch & Medin (2006) compared the causal models of energy healers and mainstream nurses for depression and heart attacks. Both groups generate both physical

and psychological factors as relevant but energy healers systematically integrated mental and physical causes for a given disease, whereas mainstream nurses systematically dissociated them (kept them on separate causal paths). Using similar methods to explore illness models among Mexican immigrants to the United States, other researchers have found that social, physical, and psychological causes play an important role in illness explanations, and that immigrants' models diverge from those of US laypersons and medical providers (Maupin & Ross 2012, Maupin et al. 2011, Mendenhall et al. 2010, Weller et al. 2012). These differences suggest that culture may influence the intuitive boundedness of the psychological domain and its relationship with the biological domain (see also Ahn et al. 2009, Nguyen & Rosengren 2004, Zhu et al. 2009).

Some observers argue that concepts of mind and matter are fundamentally variable across cultural groups and that mental-physical dualism represents a particular historical tradition rather than a universal feature of thought (Hodge 2008, Scheper-Hughes & Lock 1987). Others claim that diverse cultural beliefs about mind and body nonetheless exhibit shared conceptual dualism (Astuti 2001), as when people from different cultures treat similar sets of psychological (e.g., knowing) but not physiological (e.g., hunger) processes as dissociable from the body (Cohen et al. 2011). This field is one to watch as interdisciplinary approaches are increasingly brought to bear on mind-body concepts (e.g., Slingerland & Chudek 2011).

Multiple causation: coexisting explanatory frameworks. Another area of inquiry focuses on coexisting explanatory frameworks that integrate natural and supernatural domains (Legare et al. 2012).² These studies investigate attributions of multiple causation, whereby a single event (e.g., the collapse of a granary) is attributed to several causes that derive from different intuitive frameworks (e.g., both termites and witchcraft) (Evans-Pritchard 1937). Several lines of research address developmental and cultural influences on explanatory models for illness, death, and the origin of natural kinds (Casler & Kelemen 2008, Legare et al. 2012, Rosengren & Gutiérrez 2011, Rosengren et al. 2000).

Consider the case study of causal-explanatory reasoning about AIDS in South Africa (Legare & Gelman 2008), where cultural beliefs about the causal origins of AIDS draw upon factors related to witchcraft as well as biology. Given that people have access to multiple, discrete explanatory frameworks for reasoning about the causes of AIDS, how do they accommodate these diverse causal concepts? Both children and adults use coexisting explanatory frameworks—that is, they draw on both natural (i.e., biological) and supernatural causes to explain a single event (e.g., why a person might contract AIDS), often at different levels of causal analysis. The structure of these coexistence models varies across individuals: Different frameworks can be more or less integrated in individuals' explanations. For example, natural and supernatural frameworks may be integrated ("A witch can put you in the way of viruses and germs") or remain as distinct, alternative views of the world ("Witchcraft can cause a disease that looks like AIDS") (Legare et al. 2012, p. 783).

In addition, cultural epistemologies are linked to the perceived relevance of different explanatory frameworks across groups. In the United States, for example, fundamentalist Christians are more likely than other Americans to appeal to supernatural causes to explain the origin of species (Evans 2001). This raises questions about why and how people come to consider certain causal-explanatory frameworks relevant. New research has begun to investigate the kinds of events that attract spontaneous explanation across development and cultures (Legare & Gelman 2014; see also Subbotsky 2010, Subbotsky & Quinteros 2002, Woolley 2000).

²Here, natural concepts are defined as ideas that fall under natural conceptual domains (e.g., folkbiology) or that involve "(in principle) observable and empirically verifiable phenomena" (e.g., germs), and supernatural beliefs involve "kinds that are supernatural" (witchcraft, religion) from an "intuitive, psychological perspective" (Legare et al. 2012, pp. 780–81).

Summary and implications: conceptual domains at the intersections. In sum, a growing body of research shows that explanatory preferences can vary within individuals, depending on the reasoning context, and across cultural communities, with perceived relevance of causes closely linked to cultural epistemologies. The coexistence of causal-explanatory frameworks offers intriguing insights into everyday cognition while offering substantive questions for future work. Understanding how dualistic or supernatural conceptual modes are leveraged in everyday thinking can shed light on the more general phenomenon of causal-explanatory pluralism (e.g., Lombrozo 2010) while sharpening analysis of the psychological distinctiveness of causal frameworks tied to conceptual domains.

Research on coexisting explanatory frameworks heightens attention to naïve reasoning about multiple levels of explanation and extended causal chains, resonating with a growing body of research on complex systems thinking (Hmelo-Silver & Azevedo 2006). This interdisciplinary field focuses on how people understand dynamic systems such as ecological or social systems (e.g., Chi et al. 2012, Olson 2013, White 2008). Consider an ecosystem, for example, where causation includes nonlinear processes, feedback loops, and different levels and time frames for causal thinking (Medin et al. 2013). Thinking in levels is particularly important to complex systems thinking and involves viewing a phenomenon from different perspectives pitched at different levels of interaction (e.g., individual behavior and population-level dynamics) (Wilensky & Resnick 1999). This raises the interesting question whether coexisting explanatory frameworks, even if inspired by a single event, are actually explaining the same thing or instead are asking different questions about different levels. More generally, investigating causal cognition from the perspective of complex systems may afford new insights into conceptual behavior. Given that humans are surrounded by complex systems (ecologies, societies, consciousness), this is an area of study that deserves more investigation.

Folksociology:

intuitive understanding of other agents in terms of their social qualities, group membership, and social relations

New Perspectives on Domains

Domain-specificity theory has served as a productive lens for viewing cognition, but we are beginning to see signs that the very demarcations of these domains may be culturally infused. We consider folkecology and folksociology as alternative frames.

One potential cultural influence could lie in the focus on folkbiology over folkecology. Above, we reviewed evidence suggesting that for indigenous individuals ecological relations are a more salient organizing framework than taxonomic relations (Bang et al. 2007). This raises the possibility that many concepts traditionally subsumed under folkbiology could also be deeply ecological in nature, that is, focused on the interactions of beings, organisms, weather, and other forces (Medin et al. 2013).

When researchers do address folkecological concepts, they often bring their own perspectives to bear on defining the domain. Consider, for example, Atran & Medin's (2008) work on culture and folkbiology, focused on people's understanding of plants and animals. This research included studies of ecological knowledge involving plants and animals (including humans). Note, however, that if the initial research framing had been in terms of ecosystems, the researchers likely would have included natural inanimates such as rocks, soil, water, the sun, and the moon in their probes. They did not. The umbrella category, folkbiology, may have led them to focus on living kinds (and living kinds from a Western ontological perspective).

Another potential reorientation for domain-specificity theory comes in the form of folksociology or core social cognition (Hirschfeld 2013, Spelke et al. 2013). The proposal for folksociology as a coherent domain is based on the idea that attending to social relations, social roles, and social interactions is a natural and useful way to interpret other people's behavior (Hirschfeld 2006, 2013). The prelinguistic foundations of social cognition may be widely shared across cultures, as

seen for infant pointing with caregivers in the context of joint interaction (Liszkowski et al. 2012). Supportive evidence for the importance of folksociology can be found in the burgeoning literature focused on social knowledge and associated concepts of social relations (Banaji & Gelman 2013).

Part of the argument for folksociology as a conceptual domain stems from the idea that relational reasoning may play a greater role in everyday social cognition than folkpsychological reasoning about mental states (Hirschfeld 2013). This idea is consistent with research from many non-Western communities reporting that folk theories cultivate a focus on relationships and behavior rather than explicit attribution of mental states to others (Danziger 2006, 2010; Danziger & Rumsey 2013; Duranti 2008; Lillard 1998; Luhrmann 2011; Naito & Koyama 2006; Robbins & Rumsey 2008). Compared with Westerners, people in many cultural communities are more likely to take a nonmentalistic approach to the interpretation of people's behavior (Danziger 2006, 2010). For example, Mopan Maya treat the speaker's intentions as irrelevant to the question of lying: Any false utterance is considered a lie even if the speaker believed it to be true and the listener knew that (Danziger 2010). Such evidence implies that Western folkpsychology may be just one model among many in its emphasis on internal mental states.

From the perspective of a folk theory focused on interactions, interpretations of agency may be grounded in concepts of relational behaviors. Consequently, such theories may include a greater diversity of nonhuman agents (e.g., animals, plants) under the umbrella of intentional agency than does standard folkpsychology. This possibility would be consistent with evidence suggesting that cultural perspectives facilitate distinct modes of thinking about nonhuman animals' mental states and perspectives (Knight 2008, Knight et al. 2004, Unsworth et al. 2012). This line of thought brings us back to the question of folkecology and the extent to which people may view interactions among nonhumans as social-relational (Ojalehto et al. 2013).

In sum, by taking a broader view on concepts of the social and natural worlds, researchers are reevaluating the status of fundamental framework theories such as folkpsychology and folkbiology. Whether these particular domains represent culture-specific concerns remains to be seen. On one view, for example, folksociology could complement folkpsychology as a universal framework theory. Alternatively, the folkpsychological framework may reflect particularly Western attitudes, and what has been labeled as folkpsychology in other cultures may actually be more akin to folksociology or even folkcommunication. Future research addressing these possibilities will contribute to our understanding of cultural influences on the organization of conceptual knowledge.

CONCLUSIONS AND FUTURE DIRECTIONS: MULTIPLE FORMS OF DIVERSITY

The rich contributions of cultural research to our understanding of conceptual behavior are on display in almost every area of human cognition, ranging from spatial reasoning and sensory perception to biological thought and social cognition. It is a testament to the significance of this work that it has generated as many questions for future research as it has insights (see Future Issues, below). We conclude with reflections on how these questions might be approached in the wider context of diverse perspectives in cognitive science.

One recurring theme is the idea that people have multiple perspectives on concepts themselves. Cultural influences on cognition are often best characterized less in terms of individual concepts and more in terms of broader cultural framework theories. For example, both folkbiology and folkpsychology may be contextualized within cultural frameworks that see humans as a part of or apart from nature or view nonhumans as a part of or apart from the (social) realm of relationships (Medin & Bang 2014).

If cultural differences involve habitual ways of organizing concepts rather than stable, localized differences in a cultural concept of x , then this encourages moving beyond research paradigms designed to answer unambiguously whether a concept is universal or variable. The question may not be, Which conceptual framework does a culture have? but rather, Which cultural contexts does a conceptual framework have? The latter question orients away from essentialist treatments of culture as an independent variable and moves toward viewing cultures and concepts as interacting elements of niche construction. Just as organisms and environments select and shape one another over time, so might minds and cultures evolve in constant interaction. On this perspective, the separation between concepts and culture is itself suspect: Within the complex system of minds in community, there are no easy distinctions to be made between concepts and the cultural systems that organize and are organized by them.

The domain-specificity research framework has played a key role in catalyzing our understanding of conceptual development. Recent research has turned to the question of how people conceptualize interactions among these systems, and researchers have begun to question whether progress can be made without a folk ecology (interactions between organisms, habitats, and climate systems), a folk dynamics (e.g., weather, wave, or water systems), and a folk sociology (relational interactions between persons, human or nonhuman). Traditional cognitive domains may be more conventional than natural. If conventionalized epistemologies play a role in cognitive scientists' paradigms, then it is important to consider how notions about domains affect both what research is done and how it is conducted.

Culturally diverse research teams may have a critical advantage in asking questions and designing methods to get at the possibility of culturally variable conceptual frameworks. Indeed, we speculate that if indigenous researchers had been telling the story of cognition, they would have proposed different conceptual domains (or a different approach to conceptual organization itself) from those privileged on current accounts. Similarly, if Eastern researchers not trained in the West had told the story about East-West differences, it might be more about context and relationships and less about generalized cultural differences along some dimension (e.g., individualism versus collectivism).

Finally, it is only a small step to realize that scientific practices are (cultural) practices, leading us to our concluding comment relating the researchers to those being researched: If the researched have distinctive practices, then surely the researchers also do. Consequently, to the extent that our science incorporates multiple cultural perspectives, it will be the better for it (Medin & Bang 2014).

FUTURE ISSUES

1. A key priority continues to be increasing the diversity of study populations. Research going beyond "standard samples" (i.e., college students or Internet users in Western industrial countries) will contribute to a more inclusive and representative science of human conceptual behavior.
2. How can the investigation of multiple forms of within-group versus between-group variation in cognitive processes inform deeper understanding of concepts and cultures?
3. An important domain of interest concerns how people conceptualize complex systems (systems involving feedback processes, multiple levels of analysis, and emergent phenomena, such as ecosystems and societies). Pursuing this question will afford new insights into causal-explanatory cognition that go beyond linear cause-effect relations.

4. In light of the evidence that the traditional domains of folkphysics, folkbiology, and folkpsychology exhibit shifting boundaries and extensive cross-domain interactions across cultures, what is the way forward in domain-specificity theory?
5. How are epistemological orientations and worldviews acquired by children, and how are alternative orientations coordinated in multicultural contexts?

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

We are grateful for funding support from the National Science Foundation under grants SES 0962185, DRL 1109210, and DRL 1114530; a Graduate Research Fellowship; AFOSR grant FA9550-14-1-0030; and the Cognitive Science Program at Northwestern University. We thank Cristine Legare, Andrea Bender, Susan Fiske, Rumen Iliev, and Norbert Ross for insightful comments that greatly benefitted the current manuscript. We also thank Jennifer Woodring for extensive editorial and research assistance throughout the writing of this manuscript.

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