Chapter 14

# Mind Perception

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People seem to have access to the workings of their own minds but not to the workings of other minds. Philosophically speaking, this is supposed to create a problem for us. Because we do not have access to other minds, we cannot confidently conclude that other people have minds at all. But most of us do not speak philosophically and therefore have no trouble talking at length about other people's desires, intentions, goals, attitudes, beliefs, and emotions. Solving this *other minds problem* at all seems to be no problem at all. People worry about whether others like them or not, find them trustworthy or not, or find them attractive or not. People wonder whether others are being truthful or deceptive, whether others are motivated by greed or generosity, and whether others behaved intentionally or accidentally. And people infer their own future mental states when making decisions designed to create future versions of themselves that are happy, such as whether to marry or save for retirement. Once formed, the ability to think about other minds is so proficient that other minds appear almost everywhere that people look, from pets that become loving and considerate, to technological gadgets that become obstinate and vindictive, to gods that have goals and plans for one's life. If reasoning about other minds is a problem, it resembles an addiction more than a conundrum.

Inferences about mental states are often at the very center of social thought and behavior, and social psychologists have been working for a long time to understand how, and how well, people make them. All previous versions of the *Handbook of Social Psychology* except the first have therefore included chapters describing how people understand one another (Bruner & Tagiuri, 1954; Gilbert, 1998; Ross & Fletcher, 1985; Tagiuri, 1969)—what earlier authors called "person perception" and what Gilbert called "ordinary personology." These chapters organize the dominant research tradition on causal attribution that addresses the

process by which people intuitively explain other people's behavior to arrive at impressions of others' stable dispositions and enduring personalities. Intentional actions reveal more about someone's enduring dispositions than accidental actions, meaning that inferences about others' mental states are often at the heart of the person perception process. But before an ordinary perceiver can decide which mental states are responsible for a given action, an ordinary perceiver needs to at least implicitly determine if another agent has a mind in the first place, and then determine that agent's state of mind in the second place. Interest in these first two components of the person perception process has now attracted so much attention, from so many converging disciplines, in domains that go so far beyond basic attributional questions that it necessitates its own treatment in this handbook. Instead of having only one chapter addressing how ordinary people understand others, this handbook therefore has two (see also Macrae & Quadflieg, this volume). This chapter covers how people infer that other agents have mental states and then how people decide what those mental states might be. *That* chapter will cover, in part, how ordinary perceivers extract information from more specific features of persons—especially their face and body—to form impressions of other people's more stable and enduring identities.

Because people are capable of attributing minds to nonhuman agents such as other animals, gadgets, or gods, and are also capable of denying mental states to other humans and treating them like animals or objects, we have dropped the term *person* from our title and instead adopted Wegner's (2002) term of *mind perception*. Although people seem readily able to solve the classic philosophical version of the other minds problem, the philosophical version captures the main theme of all current research on mind perception and therefore is the central guide for this chapter.

People do not have direct information about others' mental states and must therefore base their inferences on whatever information about others' mental states they do have access to. This requires a leap from observable behavior to unobservable mental states that is so common and routine that people often seem unaware that they are making a leap (Ross & Ward, 1996). The sections of this chapter explain how mind perception differs from the more general study of person perception (Mind Perception versus Person Perception), why people reason about other minds (Why Mind?), when they are likely to do so (Activating Mind Perception), how they acquire the capacity for mind perception (Acquiring Mind Perception), how they use this capacity (Using Mind Perception), how minds are applied to a wide range of targets (Targets of Mind Perception), and why mind perception matters to social psychology (Consequences of Mind Perception).

## MIND PERCEPTION VERSUS PERSON PERCEPTION

Although other minds cannot be directly observed, they can be easily defined. People intuitively represent other minds in two broad sets of psychological capacities—conscious experience and intentional agency (Gray, Gray, & Wegner, 2007). Conscious experience involves metacognitive capacities, including secondary emotions (e.g., regret, rage, sympathy, pride, or joy; Demoulin et al., 2004; Leyens et al., 2003), conscious awareness of one's environment, and basic psychological states (e.g., fear, hunger, thirst, or pain). Intentional agency is the capacity to engage in reasoned action, self-control, strategic planning, or goal-directed behavior and therefore to possess conscious preferences, beliefs, and explicit knowledge. Agents—entities that act—are attributed these mental capacities in varying degrees along a continuum rather than as a dichotomy, with agents being seen as having more or less of a capacity rather than all or none of it. Agents can vary along these two dimensions quite independently; some have a high degree of both intentional agency and experience (e.g., the self), whereas others having a high degree of experience but little agency (e.g., a baby), high agency but little experience (e.g., God), or little agency or experience (e.g., a dead person; Gray et al., 2007; cf. Gray & Wegner, 2008).

Social psychological research on mind perception borrows much from its intellectual foundations in person perception but differs from classic work because it is both narrower and broader than the research in person perception from which it grew. It is narrower because it focuses only on inferences about others' minds—what is often called "mentalizing" (Frith & Frith, 2003)—rather than

the broader host of traits, dispositions, and capacities that people might attribute to others. People's attempts to understand other agents can be organized conceptually into three questions: (1) Does it have a mind?, (2) What state might that mind be in?, and (3) Which states of mind are responsible for the agent's behavior? Research on mind perception focuses on the first two questions, whereas much of the work in person perception has focused on the processes of integration, correction, and discounting that guide the third question. In this way, work on mind perception may be considered a kind of preattributional process, identifying the kinds of causes that might explain or predict another's behavior. Teenagers, for instance, are capable of intentional deception whereas toddlers are not, and parents trying to explain their child's behavior do well to know the difference.

Mind perception is also something of a preattributional process because the presence versus absence of mind is the defining feature of people's intuitive distinctions between people and nonpeople. The psychological line between human and nonhuman—us and them—is among the most critical distinctions that any person or culture can make, but it is also among the most difficult to objectively define (Farah & Heberlein, 2007). A growing body of literature, which we review later, suggests that this distinction is intuitively made on the relative presence versus absence of mind. People can experience conscious emotions such as shame or pride, contempt or compassion, and suffering or joy, whereas objects or technological agents are less able to do so. And most people think other humans are capable of intentional actions, self-control, and deliberate planning, whereas most people generally believe that nonhuman animals are less capable. Mind perception is therefore central to phenomena such as anthropomorphism, whereby people treat nonhuman agents as humanlike (Epley, Waytz, & Cacioppo, 2007), and to the inverse process of dehumanization, whereby people treat other people like animals or objects (Bandura, Underwood, & Fromson, 1975; Haslam, 2006; Leyens et al., 2003). Ordinary perceivers, after all, are capable of treating their pets as people and their enemies as animals. Without perceiving minds, people are not "perceiving people."

In contrast, research on mind perception is also broader than existing research on person perception because it expands the scope of agents considered by ordinary perceivers. "Social" agents include any entity that acts interdependently with others, but research in "social cognition" has almost exclusively addressed how people think about other people (Kwan & Fiske, 2008). This is unfortunate because people seem readily able to attribute humanlike mental states to all sorts of agents. The stock market can "flirt with 10,000" (Morris, Sheldon, Ames, & Young,

2007), one's crashing computer can seem to have a "mind of its own" (Waytz, Morewedge, Epley, Monteleone, Gao, & Cacioppo, 2009), and one's dog can be a loyal and caring companion (Serpell, 2003). The vast majority of people living today—and nearly all who have lived in past centuries—believe in an omniscient God (or set of gods) whose goals, intentions, and desires can be observed in the world around them (Guthrie, 1993). Mental states render an agent's behavior understandable and predictable (Baron-Cohen, 1995; Dennett, 1987; Hebb, 1946; Heider, 1958), whether those agents are people or not. Research on mind perception shifts the focus of attention from the target being perceived to the person perceiving and thereby shifts the focus from a specific target to more domain-general psychological processes involved in mental state attributions.

The emergence of this particular chapter in the *Handbook of Social Psychology* therefore marks an evolution that has gained both breadth and depth on the problem of how people think about themselves and others—a change that represents a collective focusing on topics that have proven of deep importance across disciplines. Flanking the progress in social psychology and picking up dramatic speed have been advances in developmental psychology regarding the acquisition and uniqueness of mind perception, in clinical psychology regarding perturbations in the mind perception process, in neuroscience about the biological architecture of mind perception, and in anthropology about the implications and consequences of mind perception across cultures. Social psychology serves as the hub for this research because it bridges the study of unique populations to the more general population, translates reductionist laboratory work into general mechanisms that govern behavior in everyday life, and identifies psychological processes that can predict and explain variability across cultures and levels of analyses. A chapter on mind perception is therefore perfectly suited for the *Handbook of Social Psychology*, and the surging interest in mind perception across multiple disciplines makes this a good time for the first.

## WHY MIND?

Articulating why mind perception is important to social psychologists does not explain why it seems important to everyone else. The world is full of invisible things that most people spend no time thinking about, from quarks to dark matter to what it looks like inside one's own intestinal tract. Thinking is for doing (Fiske, 1992; James, 1890), and the amount of time spent thinking about invisible minds must be for something. People do not automatically attribute higher-order mental states such as beliefs to others'

actions merely upon observing an action (Apperly, Riggs, Simpson, Samson, & Chiavarino, 2006), but instead do so when mental states are most likely to be useful. Given that our species seems to have acquired a universal capacity to reason about other minds that is shared only in the dimmest capacity by any other species (Hare, 2007; Herrmann, Call, Hernández-Lloreda, Hare, & Tomasello, 2007; Saxe, 2006), people must get something especially useful out of mind perception to warrant all of the additional neurons. This turns out to be wrong. People do not just get something useful, they get at least three things useful—the abilities to comprehend others' actions, to understand others' communication, and to coordinate one's own behavior with others' behavior. These benefits matter not only for explaining why people think about others' mental states, but also for predicting when people are most likely to activate their capacity for mind perception to reason about other minds.

### Comprehension

Spend even 5 minutes watching a foreign film without subtitles and you will recognize that uncertainty about one's environment is inherently aversive. "Human nature abhors a lack of predictability and absence of meaning" (Gilovich, 1991, p. 9), putting uncertainty, ambiguity, and unpredictability all on the short list of life's most unpleasant experiences that people try to overcome whenever possible (Cohen, Stotland, & Wolfe, 1955; Ellsberg, 1961). White (1959) suggested that the desire to understand, predict, and behave competently in one's environment was the primary motive guiding all of psychological development, whereas Kagan (1972) listed understanding and comprehension as one of four basic motivations and Fiske (2004) listed it as one of five. Although the number appears open to debate, the inclusion of understanding and comprehension as a basic human motivation is not.

When a billiard ball rolls along a pool table after being struck by another ball, nobody thinks much about the causal sequence of events. It is an entirely different matter when a billiard ball rolls *without* being struck by another ball. Self-propelled agents cannot be completely explained by forces outside the agent and instead must be explained by forces inside the agent—maybe magnetism, maybe demons, maybe mind? Understanding self-propelled movement requires an explanation of why the agent starts and stops, the intensity of the action, the direction of the action, and the nature of the action. The metaphysical language of mind provides just the kind of satisfactory answers needed to explain self-propelled action from almost any kind of agent, perhaps explaining why people seem so readily inclined to explain others' actions in terms of underlying

mental states rather than mitigating environmental forces (Gilbert & Malone, 1995). Desires and goals describe why an agent starts and stops, and their strength describes the intensity of action, whereas beliefs, attitudes, knowledge, motivation, and emotions describe the direction and nature of the action. The resulting language of intentionality combines these mental states with behavioral capacities of skill and ability (Malle & Knobe, 1997) in a way that "ties together the cause–effect relations" (Heider, 1958, p. 100). Although all behavior is caused by underlying physical properties, whether the machinery of a technological agent or the neural firings of a sentient one, the complexity of those physical properties runs into "the problem of combinatorial explosion" (Dennett, 1987) as a perceiver moves from explaining a self-propelled billiard ball to a self-propelled human. The language of intentions and mental states avoids this altogether by using the same terms to explain and understand all seemingly self-propelled action, or to predict the behavior of those agents.

That these concepts of mind are imprecise is precisely irrelevant for their functional value in gaining a sense of understanding and predictability across a range of agents. Adopting what Dennett (1987) calls an "intentional stance" by thinking of others in terms of mental states is a simple and wide-ranging approximation that serves as a practical guide for the intuitive psychologist, providing seemingly adequate reasons that explain actions and events (Malle, 1999). At the least, it works markedly better than an explanatory system without mental states.

Consider, for instance, the classic film clip of geometrical shapes created by Heider and Simmel (1944). The film depicts three geometrical shapes moving inside, outside, and around a square. The objects move as a group but in imperfect, apparently self-propelled fashion. Like a blurry picture coming into focus, the initial movements of the objects are unclear but quickly take on a coherent and organizing set of mental states that makes sense of the otherwise random movements (big square is moving around . . . and seems unhappy with little square . . . and is now chasing him around the house . . . ). All but 1 of the 34 participants who initially watched the film described it using clearly anthropomorphic mental states, and for good reason:

> As long as the pattern of events shown in the film is perceived in terms of movements as such, it presents a chaos of juxtaposed items. When, however, the geometrical figures assume personal characteristics so that their movements are perceived in terms of motives and sentiments, a unified structure appears. . . . But motives and sentiments are psychological entities. . . . They are "mentalistic concepts," so-called intervening variables that bring order into the array of behavior mediating them. (Heider, 1958, pp. 31–32)

Mental states such as beliefs, desires, and intentions provide explanations for otherwise random and seemingly senseless actions. This does not mean that the mental states people use to make sense of their world will always seem sensible to observers, such as when New Orleans Mayor Ray Nagin explained the unexpectedly horrible disaster of Hurricane Katrina in 2005 as an indication that "God is angry at America [for] being in Iraq under false pretenses [and is] upset at Black America, too" (Martel, 2006, p. A4). Nevertheless, it does help to explain why people are likely to use their mind perception abilities so widely.

All of this mentalizing can seem a bit silly to grown-ups who believe they have long stopped believing in imaginary things. Some people with harder noses than most have tried hard to avoid it but have inevitably failed. Donald Hebb (1946, p. 88), for instance, noted that a 2-year effort at the Yerkes Primate laboratory to avoid using mental states to describe chimpanzees resulted in nothing more than an "endless series of specific acts in which no order or meaning could be found," whereas by using "anthropomorphic concepts of emotion and attitude one could quickly and easily describe the peculiarities of individual animals." Behaviorists likewise disavowed all talk of mentalizing and discussion of unobservable cognitive states (Skinner, 1957), but they ultimately fell short of their promises by never being able to come up with an alternative language that either they or others were willing to use (Chomsky, 1959). Mental states turn others' actions into something meaningful, orderly, and seemingly comprehensible, an outcome that is deeply satisfying to perceivers so deeply motivated to understand.

## Communication

Mental states enable understanding not only of what other agents do but also of what others say. Communication inherently involves getting information from one person's head to that of another to achieve shared understanding, a task that at least implicitly requires considering another person's desires, beliefs, intentions, and knowledge (Clark & Wilkes-Gibbs, 1986; Fussell & Krauss, 1992; Isaacs & Clark, 1987; Schober, 1993; Wilkes-Gibbs & Clark, 1992). Norms of conversation (Grice, 1975) dictate that people follow the "principle of optimal design," sharing only relevant information that accounts for the knowledge shared by both speakers and listeners. From a speaker's perspective, knowing what is relevant for communication requires thinking about what listeners know and what they do not. Fewer details, for instance, are required when giving driving directions to a local than to a visitor, and people do indeed alter their communication to match the apparent knowledge of a listener (Lau, Chiu, & Hong, 2001).

From a listener's perspective, understanding communication requires clarifying the ambiguity inherent in almost all spoken language based on the speaker's presumed intentions and goals. The same comment about one's "nice work," "great haircut," or "brilliant remark" could be interpreted as a genuine compliment from a friend or a sarcastic barb from a foe, depending on the speaker's presumed intention. Identical words can therefore communicate different meanings, and knowledge about the underlying intention is required for information to be communicated effectively. Notice, for instance, the importance of a journalist's intentions when interpreting the following (genuine) newspaper headlines: "Prostitutes appeal to Pope," "Miners refuse to work after death," "Red tape holds up new bridges," and "Kids make nutritional snacks."

Because communication relies so heavily on mental state inferences, language use and mind perception are close traveling companions in the psychological literature. When people fail to communicate effectively, it is often because of a failure of mind perception to know what needs to be said or to understand what was just said rather than a more basic failure to know how to use a given language (Keysar & Barr, 2002). And people who are slow to develop language, namely, deaf children whose parents do not use sign language, are also developmentally delayed in their abilities to reason about others' mental states (de Villiers, 2005). Whether the ability to reason about mental states is necessary for language to develop (Baron-Cohen, 1995; Bloom, 2000; Hare, 2007), or the other way around (de Villiers, 2005; Gernsbacher & Frymiare, 2006), is unclear. What is clear is that the ability to reason about mental states is a major benefit when communicating with others, and this benefit is likely one of the reasons that people think about others' mental states so readily.

## Coordination

Understanding one's own and others' behavior is good, being able to communicate with others is better, but being able to use this understanding and communication to predict others' behavior is the best. Understanding why another agent performs a particular action is a prerequisite for predicting it, and mind perception enables the ordinary perceiver to reason about mental states that are positively correlated with subsequent behavior. In a world of interdependent relationships where people are trying to cooperate and compete, help and hurt, and persuade and deceive, being able to reason one step back about mediating mental states allows people to stay one step ahead of others' subsequent behavior. Mind perception does not give people magical powers of foresight that operate with perfect acuity, but it provides enough predictive validity

that evolutionary psychologists consider the acquisition of this capacity to be one of the most likely reasons the human brain is three times larger than that of our nearest primate relative (Herrmann et al., 2007).

Reasoning about other minds can be useful for coordinating action to achieve a wide variety of goals. Within groups and societies, for instance, knowing "who knows what" enables effective decision making. Instead of requiring that each person know the same information within each group, simply remembering what every other person in the group (or society) knows enables group members to identify appropriate experts when necessary. Such "transactive memory" (Wegner, 1986) can enable groups to make decisions more quickly and efficiently (Ren, Carley, & Argote, 2006; Zhang, Hempel, Han, & Tjosvold, 2007) and generally improves group performance on interdependent tasks by giving individuals access to more knowledge than they could possess alone (Austin, 2003; Lewis, Lange, & Gillis, 2005; Moreland & Argote, 2003; Wegner, 1995). In negotiation and conflict resolution, accurately identifying the other side's preferences can enable more desirable outcomes for both parties (Elfenbein, Foo, White, Tan, & Aik, 2007; Galinsky, Maddux, Gilin, & White, 2008; Neale & Bazerman, 1983; Thompson & Hastie, 1990), whereas incorrectly identifying the other side's preferences and motives can lead to less desirable outcomes (Epley, Caruso, & Bazerman, 2006). And in almost any interdependent social relationship where achieving one's own goals depends on others, mind perception is centrally involved in decisions about whether to trust another person and cooperate with them or to distrust and compete with them (Lee, 2008; McCabe, Smith, & LePore, 2000; Rilling, Sanfey, Aronson, Nystrom, & Cohen, 2004). Social interaction is often likened to a game of chess, and accurately using mental states to predict others' behavior enables people to play well.

Perhaps the most basic interpersonal goal facilitated by mind perception, however, is to affiliate and connect with desirable others (Baumeister & Leary, 1995). This goal requires people to think about others' existing impressions of the self, to behave in ways that are likely to maintain those favorable impressions, and to consider how one's own behavior is likely to be interpreted by others (Snyder, 1974). For instance, in the Machiavellian classic *How to Win Friends and Influence People* (1936/1981), Dale Carnegie advised readers to "try honestly to see things from the other person's point of view" (p. 175) and to "talk in terms of the other person's interests" (p. 98). Indeed, increasing the sense of shared interests among people also increases social connection and liking (Brewer, 1979; Byrne, 1971; Tajfel, 1981). Considering another's goals, intentions, emotions, and beliefs can lead people to

identify those who are likely to be good targets for affiliation and to tune their behavior so that it is consistent with a target's presumed beliefs to increase the similarity and connection (Galinsky, Ku, & Wang, 2005; Sinclair, Huntsinger, Skorinko, & Hardin, 2005). Being finely attuned to others' mental states can indeed be a fine way to win friends and influence people, and being oblivious to them is a fine way to end up alone (Davis, 1983; Galinsky et al., 2005). Given that social isolation was tantamount to a death sentence for most of human evolutionary history (Case & Williams, 2004), it is perhaps no surprise that normally developed humans possess the apparently universal capacity for mind perception (Baron-Cohen, 1995).

Finally, mind reading is beneficial for coordination in a slightly different interpersonal context—coordinating one's current behavior and goals with one's future self. People think about themselves at some point in the future in much the same way that they think about others (Pronin, Olivola, & Kennedy, 2008; Pronin & Ross, 2006), using the same psychological processes that enable people to reason about mental states in others (Buckner & Carroll, 2007). People marry, divorce, accept jobs, and save for retirement at least partly based on beliefs about what will make their future minds feel happy and contented. Although people often make the same kinds of mistakes when thinking about their own future mental states (Wilson & Gilbert, 2005) as they do when thinking about others' mental states (e.g., Epley, 2008; Keysar & Barr, 2002; Nickerson, 1999; Van Boven & Loewenstein, 2003), there are also many benefits to strategic planning and preparation that may ultimately make it worth the occasional costs of regret and wasted resources.

**Summary: Why Mind?**

Ultimately, the only relevant outcomes for the mindless machinery of natural selection are survival and sexual reproduction, and the capacities that enable people to live long enough to have many viable offspring are likely those passed from one generation to the next. It is not hard to tell a story about how a keen mind-reading ability would increase the likelihood of both survival and sex (Nichols & Stich, 2003). Guthrie (1993), for instance, suggests that people have a systematic bias toward seeing humanlike mental states in other agents—even nonhuman agents—because the consequences of failing to detect an intentional agent in one's environment exact a greater cost on one's reproductive fitness than mistakenly identifying an intentional agent that is not there. Mithen (1996) suggests that the attribution of humanlike mental states to nonhuman stimuli has been adaptive in providing a useful analogy to reason about both the natural world and technology (tools,

weapons, etc.) that is necessary for survival. Herrmann et al. (2007) suggest that rampant mind perception and social intelligence are critical for living successfully in large groups and societies, evidenced by the strong correlation between social complexity and brain size among nonhuman primates (Dunbar, 2003).

It is not that such evolutionary explanations are likely to be wrong, but rather that they are extremely difficult to test. We have therefore focused on more proximal explanations. In particular, knowledge about one's own and others' mental states seems critical for explaining behavior, for communicating effectively, and for coordinating actions. Although the ability to think about other minds and get beyond one's own limited perspective may be among the most useful capacities that evolution has built into the human brain, this does not mean that it is used to solve all of our problems, at all times, and in all circumstances. Capacities are not to be mistaken for tendencies. The primary uses of mind perception matter because they provide insight into when people are likely to activate this capacity and when they are not.

## ACTIVATING MIND PERCEPTION

The benefits of mind perception are inherently social in nature, enabling interdependent actions across the gap between self and others, as well as the gap between the present and the future. Getting into the mind of another agent is therefore most beneficial when interdependence exists between self and others or when one's current decisions are directly related to one's future reality. As a result, situational and dispositional factors that increase interdependence also increase attempts to get beyond one's own current perspective to consider the minds of others.

Power is perhaps the clearest determinant of social interdependence. Those in positions of power are independent of others because their own outcomes are unaffected by others' actions, whereas those without power are inherently interdependent because their outcomes are controlled by others' actions (Fiske, 1993). Independence is not an ancillary feature of social power; it is the defining feature (Keltner, Gruenfeld, & Anderson, 2003). And as one would predict given the benefits of mind perception, people in positions of power are less likely to consider others' mental states than are people in positions without power.

The powerful, for instance, are less likely than the relatively powerless to attend to other people amid social interactions (Erber & Fiske, 1984; Neuberg & Fiske, 1987; Ruscher & Fiske, 1990), are less able to accurately identify others' interests and attitudes following a social interaction (Keltner & Robinson, 1997), are less likely to report

trying to see things from the other person's perspective in everyday life (Galinsky, Magee, Inesi, & Gruenfeld, 2006), are less likely to experience empathy and compassion for the suffering of another person (Van Kleef et al., 2009), and are *more* likely to treat others as mindless objects to achieve their own goals (Gruenfeld, Inesi, Magee, & Galinsky, 2008). In one simple demonstration, participants were asked to draw the letter *E* on their forehead (as a measure of self-focused attention, Hass, 1984). Those who had just reflected on a time that they were in a high-power position were less likely to draw the *E* in an other-focused manner so that it could be read from an observer's perspective compared with those who had just reflected on a time they had been in a low-power position (Galinsky et al., 2006). This does not mean that people in a position of power are unable to consider others' mental states if they are specifically motivated to do so (e.g., Overbeck & Park, 2006), but rather that possessing independence from others is likely to diminish people's tendency to use their mind perception abilities.

Other factors that increase interdependence support this more general conclusion as well. Those who are especially motivated to connect with others, for instance, are more likely to attend to others' emotions (Pickett, Gardner, & Knowles, 2004), are more likely to mimic others' behavior in a social interaction (Cheng & Chartrand, 2003; Lakin & Chartrand, 2003), and are more likely to attribute mental states to nonhuman agents such as electronic gadgets and pets (Epley, Akalis, Waytz, & Cacioppo, 2008). People are more likely to seek information about others' mental states when they expect to meet them in the future than when they do not (Douglas, 1984, 1990) and are more likely to accommodate another's perspective when effective communication is important (Higgins, McCann, & Fondacaro, 1982; Higgins & Rholes, 1978; Krauss & Fussell, 1991; Zajonc, 1960). The actions of those perceived to be a direct threat to the self—and hence more interdependent on one's own actions—are perceived to be more intentional than the actions of those who are not perceived to be a threat (Kozak, Czipri, Felczak, & Correll, 2009). Even thinking about money, the presence of which enables independence from others (Vohs, Mead, & Goode, 2006), decreases the tendency to adopt another's perspective in social interaction (Mead, Caruso, Baumeister, & Vohs, 2009). Mind perception is critical in interdependent contexts, and those contexts indeed appear to activate one's mind perception abilities.

Situational influences can alter the tendency to engage in mind perception from one moment to the next, but developmental and cultural influences can create longer-lasting changes from one person to another. Having siblings increases a child's need to consider other minds, and children with siblings appear better able to reason about other minds than do children without siblings (Jenkins & Astington, 1996; Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996; McAlister & Peterson, 2007; Perner, Ruffman, & Leekam, 1994). Beyond the local culture of one's family, the interdependent nature of one's broader ethnic or national culture influences mind perception. Markus and Kitayama (1991, p. 229) note that "the reciprocal interdependence with others that is the sign of the interdependent self . . . requires inhibiting the 'I' perspective and processing instead from the 'thou' perspective. . . . The requirement is to 'read' the other's mind and thus to know what the other is thinking or feeling." Collectivist cultures in which the interdependent self-concept dominates, such as in Southeast Asia, therefore tend to produce individuals who are also more likely to consider other minds in social interactions compared with members of independent cultures, such as the United States and Western Europe, who focus more heavily on the self (Cohen & Gunz, 2002; Leung & Cohen, 2007). When interpreting spoken instructions, for instance, members of collectivist cultures tend to consider the speakers' intentions and visual perspective more readily than do members of individualist cultures (Wu & Keysar, 2007). Like any other behavioral tendency, thinking about other minds may become more habitual in an environment that reinforces people for doing so.

All of these results suggest that activating one's capacity for mind perception can be moderated by the interdependent nature of the social context. This should not be taken as evidence, however, that people automatically think about other minds in interdependent contexts. Monitoring others' thoughts requires attention and mental effort, and people can consider others' perspectives only after they have acquired a perspective themselves. People can therefore fail to consider others' mental states because they are so absorbed in their own. In negotiations between individuals or groups, for instance, explicitly asking people to consider the other side's thoughts and preferences can significantly alter people's behavior and the outcomes of the negotiation, suggesting that negotiators who were not explicitly instructed were also not naturally considering others' perspective to the same degree. Sometimes such perspective taking can improve negotiation outcomes because it highlights potential integrative solutions (e.g., Galinsky, Maddux, et al., 2008; Neale & Bazerman, 1983; Thompson & Hastie, 1990), and sometimes it can hinder negotiations because it highlights selfish and conflicting motives in others (Epley et al., 2006). Regardless of the direction, both effects arise because considering others' thoughts activates information that was not activated already when people were absorbed in their own perspective. These results simply serve as a reminder that others'

mental states are inherently invisible, and that people are unlikely to see them unless they are actively looking for them.

Although increasing the degree of interdependence is the most widely studied moderator of activating the capacity to consider other minds, it is not the only one. For instance, considering the meaning of an event (i.e., why an event happened) makes the agent performing the event seem more mindful compared with focusing on low-level details of the event (i.e., how an event happened; Kozak, Marsh, & Wegner, 2006). Likewise, increasing the apparent unpredictability of an agent increases attention to the agent's mental states (Barrett & Johnson, 2003; Epley, Waytz, Akalis, & Cacioppo, 2008; Waytz, Morewedge, et al., 2009). These additional findings are consistent with the main benefits of mind perception discussed in the previous section, suggesting that people are more likely to think about other minds when explaining, understanding, or predicting others' actions.

The results discussed in this section provide some insight into *when* people are likely to think about other minds but not into *how* people do so once the capacity is activated. Understanding how people solve the other minds problem requires first looking beyond the traditional boundaries in social psychology to understand how people acquire the capacity to reason about other minds over the course of development and then identifying tasks that reveal the mechanisms enabling people to make inferences about others' mental states. We take both of these steps in turn over the next two sections.

## ACQUIRING MIND PERCEPTION

Like many desirable human capacities, such as the ability to effectively use language, tools, or basketballs, people are not born with the ability to overcome the other minds problem but instead develop the ability over time. Social psychologists are not usually excited about explaining variability in a person's behavior across time, largely because they are more interested in explaining variability in a person's behavior across situations at a single point in time. But in this case, longitude informs latitude. The longitudinal trajectory of mind perception across time provides insight into variability in mind perception across situations at any one point in time. Reasoning about some mental states (intentions and goals) seems to be easy, whereas reasoning about other mental states seems to be difficult (mistaken beliefs and differing perspectives). The speed with which these capacities develop in children can help to identify which is which. Many errors committed by children as their capacity develops are the same kinds

of errors committed by adults when their capacity is taxed, differing more in the degree of error rather than in the kind of error. Understanding how the ability to reason about mental states comes into being over the course of years has been fruitful for understanding how this capacity functions over the course of moments in full-grown adults.

### A Theory of Mind

Tracking the development of any capacity requires a concrete understanding of the capacity being tracked and how to measure it. Mind perception involves making inferences about one's own and others' mental states by positing unobservable properties such as intentions, desires, goals, beliefs, and secondary emotions to serve as mediators between people's sensory input and their subsequent action. This inferential process is usually referred to as a *theory of mind* for two main reasons, "first, because such [mental] states are not directly observable, and second, because the system can be used to make predictions, specifically about the behavior of other organisms" (Premack & Woodruff, 1978, p. 515). Considerable confusion and inconsistency has plagued the use of the term "theory of mind" because it has been used at some times too narrowly by including only theory-based inferences about other minds and at other times too broadly by including social cognitive inferences that do not involve mind perception per se (e.g., dispositional inference). We therefore use "theory of mind" to refer only to a person's intuitive belief that other agents do indeed have minds and that this belief contains some knowledge about how minds work.

Understanding what a theory of mind would entail is easier than knowing when someone is using it. Premack and Woodruff (1978) first raised this issue when considering whether chimpanzees have a theory of mind. They demonstrated, for instance, that a chimpanzee watching a person perform a goal-directed action (e.g., struggling to get a banana out of a locker) would consistently select a tool that would enable the person to achieve a presumed goal (e.g., a key) when given the choice between a relevant and an irrelevant tool (e.g., a key or a hose attached to a water spigot). Three commentators were unimpressed and independently suggested a different method that has dominated research in this area ever since—testing cases in which a target's mental states differ from a perceiver's own mental states (Bennett, 1978; Dennett, 1978; Harman, 1978). Dennett, for instance, noted that simple associations and learned experience could create behavior that looked the same as using a theory of mind. Because true beliefs tend to correspond with reality, this covariance makes it difficult to determine whether agents are responding to their own beliefs about reality or to what they know about

another agent's beliefs. To identify that perceivers are using a theory of mind would require testing their ability to reason from another agent's *false* beliefs—or another's belief that differs from one's own belief. More than simply providing a suggestion, Dennett also provided a method of experimentation (as did Harman, albeit less explicitly). What if the key that normally opened the locker had been moved to a new location by an evil experimenter, who then swapped a useless key in its usual place? Would the original experimenter look in the location where the key is usually kept, and where the original experimenter therefore believes it to be? Or would the original experimenter look in the new location, where the perceiver now knows it to be?

This procedure has come to be known as the false belief task (Baron-Cohen, Leslie, & Frith, 1985; Wimmer & Perner, 1983). It is generally considered one of the critical markers of a fully developed theory of mind because it requires using many of the most sophisticated elements of mind perception—postulating unobservable mental states, using those states to predict behavior that would differ from the way an objective observer would respond, and using those mental states (in humans) to explain the target's mistaken action. Solving the false belief task requires, at least theoretically, the recognition that others' mental states may differ fundamentally from one's own and that behavior is determined by others' beliefs independent of one's own beliefs. Armed with a new method and a clear goal, psychologists raced to discover when this theory of mind develops in children, who can solve theory of mind tasks and who cannot, and what factors alter the ability to solve these tasks. The resulting research produced a flurry of results and a blizzard of controversy. Once everything settled, the following firm conclusions remained.

### Developing a Theory of Mind

**Cross-Age Development**   Reasoning about other minds first requires paying some attention to the agents that might possess minds. This begins early, around 3 months of age, when children start finding the common targets of mind perception especially interesting and show preferential attention toward other people (Legerstee, 1991), animate objects (Crichton & Lange-Küttner, 1999, and biological motion (Bertenthal, Proffitt, & Cutting, 1984). This hypersensitivity to agency remains a critical component of mind perception for the rest of people's lives (Barrett, 2000).

After attending to agents that might possess a mind, observers need to develop a tendency to interpret and understand those agents' actions in terms of mental states such as desires and intentions (e.g., she *likes* that or he *wants* to leave). Around 6 months of age, children appear to distinguish between goal-directed action and simple biological motion, attending longer to novel goal-related actions (e.g., an experimenter reaching for a new toy after reaching repeatedly in the same way for another toy) than to novel biological action directed toward the same goal (e.g., an experimenter reaching for the same toy after repeatedly reaching for it using a different behavioral grasp; Woodward, 1998). Children as young as 7 months even imitate another person's goal-directed reach regardless of whether the goal was achieved but do not mimic accidental or apparently unintentional reaching (Hamlin, Hallinan, & Woodward, 2008; see also Carpenter, Akhtar, & Tomasello, 1998; Meltzoff, 1995). By 2 years of age, children use an agent's intentions to encode their actions, such as using an artist's intentions when providing names for drawings (Preissler & Bloom, 2008).

Selectively attending to other agents does not, however, give insight into other agents' mental experience without the additional capacity of sharing their attentional perspective. Most adults know that if you want to find out what people are thinking you should pay attention to where they are looking. Indeed, people not only think about objects they are led to look at (Grant & Spivey, 2003) but also tend to look at objects they are thinking about (Rayner, 1998; Tanenhaus, Magnuson, Dahan, & Chambers, 2000; Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1996). Children seem to implicitly understand this as early as 2 months, when they look preferentially at a person's eyes compared with other aspects of the face (Maurer, 1985), and by 2 years they can almost perfectly orient themselves in the direction of another's gaze (Baldwin, 1991, 1993). The eyes may not provide a window into a person's soul, but they certainly provide a window into that person's mind by developing joint attention between a target and a perceiver.

With these foundational abilities of attending to social agents, representing desires and goals, and acquiring joint attention in place, theory of mind begins to develop with more sophistication. Between 18 months and 2 years, children begin to identify intentions from an actor's speech (Baldwin & Moses, 1996) and begin using mental states (e.g., "want") in their own speech (Bartsch & Wellman, 1995; Bretherton & Beeghly, 1982; Wellman, 1993). Children around this time also develop a more complete understanding of the concept "desire" and its implications, understanding that people behave in accordance with their desires and are unhappy if they do not get what they want (Bartsch & Wellman, 1995). By age 3, children also develop a more complete understanding of intention, differentiating intended from unintended action (Shultz, 1991), and between 4 and 5 years children understand intentions as separate from desires and as separate from the outcomes of intentional acts (Astington, 1993; Moses, 1993).

A fully sophisticated theory of mind, however, involves not only the recognition that other agents have mental

states that predict and explain behavior—children seem to overcome the philosophical version of the other minds problem before they are out of diapers—but also the added ability to recognize that others' mental states may differ from one's own. Differing motivations, goals, intentions, beliefs, or even vantage point may lead people to perceive, evaluate, and understand the same stimulus in different ways. A fully developed theory of mind enables perspective taking—the ability to reason about others' mental states independent of one's own. Piaget (1959) recognized that this ability to overcome egocentrism marked the major difference between children and adults:

> We have endeavored to show . . . that thought in the child is egocentric, i.e., that the child thinks for himself without troubling to make himself understood nor to place himself at the other person's point of view. . . . If this be the case, we must expect childish reasoning to differ very considerably from ours, to be deductive and above all less rigorous. (p. 1)

Various measures suggest that children, at least in terms of their theory of mind, start looking more like adults around the age of 4 or 5 (Deutsch & Pechmann, 1982; Flavell, 1986; Sonnenschein & Whitehurst, 1984). Most extensively studied at this age are children's abilities to reason about false beliefs. Following the suggestions by Dennett (1978) and others described earlier, Wimmer and Perner (1983) developed the false belief task in which participants are asked to predict how someone with a false belief is likely to act. In the typical false belief task, participants watch a story in which one character (Sally) places an object (a key) in a drawer and then leaves the room. While Sally is away, her sister (Ann) walks into the room and moves the key to a cupboard on the other side of the room. Sally then returns to the room, and participants predict where Sally will look for the key. The obvious answer to any adult is that Sally will look where she *believes* the key to be, namely, in the drawer where she put it. This is not obvious, however, to a 3-year-old, who is likely to predict that Sally will look where the child knows the object to be, namely, in the cupboard. Children start to solve this particular problem correctly around the age of 4 and do so more reliably around the age of 5 in cultures around the world (Callaghan et al., 2005; Perner, Leekam, & Wimmer, 1987; Perner & Wimmer, 1985).

The development of the ability to reason about false beliefs in others mirrors the development of the ability to attribute false beliefs to the self. Three-year-olds who learn a fact during an experimental session, for instance, tend to claim that they have always known that fact, whereas 4- and 5-year-olds report that they did not know the fact before the session (Taylor, Esbensen, & Bennett, 1994). This difficulty in reasoning about false beliefs in others

appears to stem from difficulties inhibiting one's own present perspective or knowledge (Carlson, Moses, & Hix, 1998; Carlson & Moses, 2001; Zaitchik, 1991), a difficulty that leads to conceptually identical egocentric biases in judgment among full-grown adults (Birch & Bloom, 2007; Epley, Keysar, Van Boven, & Gilovich, 2004; Keysar & Barr, 2002). Although this ability to reason about others' perspectives may not develop quite as quickly as many parents would like, the basic components of a fully developed theory of mind are already in place by the time most children are off to kindergarten.

**Cross-Species Development**   Human infants acquire the ability to reason about other minds over the course of years, but *Homo sapiens* acquired it over the course of millennia. Notable similarities and differences in mind perception exist between humans and their closest relatives, similarities that bear testament to a common evolutionary ancestry and differences that may help to explain notable gaps in behavioral capacities. Premack and Woodruff (1978) questioned whether chimpanzees have a theory of mind, and the answer has proven elusive ever since. Although such attempts have long been plagued by allegations of rampant anthropomorphism on the part of researchers rather than actual abilities on the part of primates (Asquith, 1986; Darwin, 1872/2002; Hebb, 1946; Povinelli & Vonk, 2003), there are now good reasons to believe that chimpanzees and some other great apes possess a rudimentary theory of mind that is similar to that of a developing human (Call & Tomasello, 2008). Like young infants, chimpanzees preferentially attend to social agents and can track (albeit not perfectly) another agent's eye gaze to monitor that agent's attention (Povinelli & Eddy, 1996a). Chimpanzees also have some understanding of goals. Like human infants (Behne, Carpenter, Call, & Tomasello, 2005), chimpanzees differentiate between intentional and accidental behavior, responding differently, for instance, when a person fails to give them food because of an inability to do so versus an unwillingness to do so (Call, Hare, Carpenter, & Tomasello, 2004). Chimpanzees also respond differently to accidental versus intentional actions (Call & Tomasello, 1998), such as when another chimpanzee steals food versus receives the same food innocently (Jensen, Call, & Tomasello, 2007). Chimpanzees also imitate an intentional action even when the action has not been completed (Myowa-Yamakoshi & Matsuzawa, 2000; Tomasello & Carpenter, 2005). Chimpanzees will hand a person an object they appear to be reaching for intentionally, for instance, but not one that the person is "reaching" for only accidentally (Warneken & Tomasello, 2006).

More advanced capacities also emerge among chimpanzees, most notably the recognition that other agents possess

beliefs and knowledge. Chimpanzees not only track others' eye gaze but also communicate in gestures that suggest an understanding that other agents' knowledge is at least partly a function of their visual perspective (Povinelli & Eddy, 1996b). Chimpanzees, for instance, are more likely to hide or take food from others when they are not looking or when others' vision is occluded (Hare, Call, & Tomasello, 2006; Melis, Call, & Tomasello, 2006).

Although chimpanzees have these basic building blocks in place for a fully functioning theory of mind, they do not seem able to understand false beliefs or recognize that others' evaluations of a stimulus might differ fundamentally from their own (for reviews, see Call & Tomasello, 2008; Hare, 2007; Penn & Povinelli, 2007). Chimpanzees fail nonverbal versions of false belief tasks that 5-year-old humans readily pass (Call & Tomasello, 1999), even when the task is competitive and rewards are clearly contingent on performance (Hare, Call, & Tomasello, 2001).

Such a divergence in mind perception could arise either because humans have acquired more general intelligence over evolutionary time or because humans have acquired more *social* intelligence in particular. Emerging evidence suggests that evolution may have favored particular over general. Consider one particularly ambitious set of experiments comparing a sample of more than 100 2.5-year-old humans with the same number of adult chimpanzees (and 32 more distantly related orangutans for good measure; Herrmann et al., 2007). No meaningful difference emerged among these groups in performance on technical or physical tasks, such as the ability to track a reward after its location changed, the ability to understand and use numerical quantities, or several measures of the ability to understand causal relations (including using tools). Humans and chimpanzees solved approximately 68% of these tasks correctly, and orangutans solved 59% correctly. Large differences emerged, however, on the three major tests of social intelligence, including the ability to learn by mimicking others, the ability to communicate through gestures that accommodate another's attentional state, and two theory of mind tests (following an actor's gaze and understanding an actor's intention following an unsuccessful action). Children solved these social tasks correctly nearly 75% of the time, whereas chimpanzees and orangutans did so 33% and 36% of the time, respectively. Although still a matter of speculation, these authors suggest that this heightened social intelligence serves "as a kind of 'bootstrap' for the distinctively complex development of human cognition in general" (Herrmann et al., 2007, p. 1360). Our nearest primate relatives have the building blocks necessary for mind perception but not the full ability to reason about others' mental states independent of one's own. This seemingly unremarkable difference may be the one ability out of which other sophisticated human capacities develop—from imagining the future, to reconstructing the past, to using symbolic language (Hare, 2007). Science may not end up identifying mind perception as the critical human capacity that moved us as a species from savannahs to skyscrapers, but it is not a bad bet.

### Methods of Acquisition

The trajectory through which people develop a theory of mind does not explain how people acquire it, but understanding this process of acquisition provides insight into how adults in everyday life are likely to use their mind perception faculties. Before psychological science required calculations to make assertions, many philosophers noted that the easiest way to solve the other minds problem was to use one's own mental experiences as a guide or analogy (e.g., Hume, 1739/1958; Kant, 1781/1953; Russell, 1948; Smith, 1759/1976). Common to all of these proposals is that understanding others' mental states first requires, as Mill (1872/1974) suggested, understanding "my own case"—understanding how one's own mind works by noting covariance between one's own behavior and one's inner experience. Theories about other minds may develop out of childhood experience with one's own mind following basic principles of inference—that agents should have minds like one's own to the extent that they appear similar on relevant dimensions.

Almost immediately after birth, human infants mimic an adult's facial expression, head movements, and hand gestures (Meltzoff & Moore, 1997). Such mimicry occurs quite automatically through the rest of life (Chartrand, Maddux, & Lakin, 2005). This provides a mechanism for developing a theory of mind because people tend to use their own actions and behaviors as information when making inferences about their own experiences, thoughts, and intentions. Adults, for instance, find cartoons to be funnier when holding a pen in their mouth that forces a smile (Strack, Martin, & Stepper, 1988), find persuasive messages even more compelling when nodding their heads up and down (Wells & Petty, 1980), and rate stimuli more favorably when moving their arms in an approach-oriented posture than when moving them in an avoidance-oriented posture (Cacioppo, Priester, & Berntson, 1993; for a review, see Semin & Smith, 2008). Others' emotions and experience are contagious, at least in part, because humans from the early moments of life find themselves quite naturally mimicking others' actions (Hatfield, Cacioppo, & Rapson, 1994; Meltzoff & Brooks, 2001).

Many systematic mistakes that young children make when reasoning about others suggest that young children do indeed assume that others' mental states are the same as one's own. For instance, if children are shown a pencil

box containing candy, 3-year-olds mistakenly report that they knew the contents of the box all along before opening it and that others will know the actual contents of the box as well, whereas older children correctly note they believed the pencil box would contain pencils rather than candy and that others will also be mistaken (Astington & Gopnik, 1988; Gopnik & Astington, 1988). These mistakes are not random but instead are systematically egocentric. Children predict that other agents will know what "I" know and behave accordingly. When children are able to understand themselves and the workings of their own mental states, they readily apply these mental states to others (Harris, 2002; Meltzoff, 2007; Piaget & Inhelder, 1956). The symmetrical nature of theory of mind development for perceiving oneself and for perceiving others suggests that children may use knowledge about the self to understand others' minds (Harris, 1991; Johnson, 1988) or that the same theories and perceptions that guide self-understanding also guide the understanding of others (Gopnik & Meltzoff, 1994). As we discuss later, it is likely that both of these processes are operating. To at least some degree, acquiring information about one's own experiences and resulting mental states serves as a likely guide to acquiring information about others.

If infants begin their education about others' mental states by assuming that other minds are similar to one's own (Meltzoff, 2007), then they earn their interpersonal doctorates by recognizing the subtle and nuanced ways in which their own perceptions are unique. Later transitions in theory of mind development appear to involve acquiring information from external observation and through social learning that suggests one's own egocentric perspective is an imperfect analogy for reasoning about other minds (Gopnik, 1996; Gopnik, Slaughter, & Meltzoff, 1994; Gopnik & Wellman, 1994). Culture provides one influential source of such information, and variance in theories of mind appear to stem at least partly from external knowledge conferred to young children over the course of development, rather than simply through egocentric experience. Children living in rural cultures, for instance, acquire different theories about nonhuman animal minds compared with children living in urban cultures, cross-cultural variance that appears better explained by differences in socialization than by differences in first-person simulation (Anggoro, Waxman, & Medin, 2008; Lillard, 1998; Shweder & Bourne, 1984). Similarly, experience that one's own mental states may differ from others is gained more quickly when more other minds are present to learn from. Family members have a critical influence on theory of mind development, suggesting a process of apprenticeship whereby children learn about mental states from close others. Recall that children with siblings, for example, show reliably better performance

on false belief tasks (Perner et al., 1994). Children whose parents discuss mental state terms early in development also understand false beliefs more quickly (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991).

Acquiring the ability to reason about other minds occurs in a relatively predictable pattern, incorporating two broad sources of information—first-person experience from the inside and third-person observation from the outside. Of these, first-person experience appears primary in development, with the basic mechanisms that would enable first-person experience of others' inner mental states present already at birth (or at least as close to birth as new mothers are willing to let scientists get). The mistakes made by young children, as well as by nonhuman primates, are consistent with an early egocentric view of the world that is later supplanted by recognition that first-person experience may be misleading and that one's egocentric perception may be inappropriate as an analogy for others. A fully developed theory of mind therefore employs acquired information about the agent being perceived and information acquired from a host of external sources and observations about how particular minds work. How these two sources of information create a fully developed theory of mind, and the precise degrees to which first-person perception versus third-person observation are involved, is actively debated (Goldman, 2008; Nichols & Stich, 2003) and discussed in more detail in the next section. What seems clear at the moment is that both sources of information appear necessary to explain the entire existing pattern of evidence from early infancy to later childhood, and attempts to reduce this complexity into a single source of information so far have favored parsimony over reality.

## Summary: Acquiring Mind Perception

Understanding the development of mind perception is relevant for social psychologists not because of the timeline it produces but rather because of the stairway it suggests. The precise time at which some capacity can be detected is at least partly a function of the precision of the measure to track it. As those measures become more sophisticated (or as the tasks get easier), the dates at which capacities emerge become increasingly earlier. This may lead, by extrapolation, to the feeling that developmental psychologists will eventually show that an infant can write *The Brothers' Karamazov* if only given the right kind of pencil. One recent study using a nonverbal version of the false belief task, for instance, reports that children as young as 15 months may be predicting others' behavior based on the other person's presumed beliefs (Onishi & Baillargeon, 2005), instead of at four to five years old as observed in linguistic versions of the false belief task.

The more important point is to notice the pattern in which capacities develop and appear to build on one another across different measures. Infants do not enter the world with an intuitive understanding of how minds work, but they develop it quickly. The process that adults go through when reasoning about other minds does not literally recapitulate the developmental trajectory they followed to acquire that capacity, but there are notable similarities. Adults tend to naturally mimic other people's behavior, are relatively generous in attributing mental states to nonhuman agents, reliably use simple mental state concepts such as intentions and desires to explain others' behavior but less reliably use more complicated concepts such as knowledge and beliefs, have an easy time inferring that others' preferences are similar to their own, and have relatively more difficulty reasoning about cases when others' preferences are different than one's own. Parents are considerably more adept than their children at mind perception, but they do not seem to outgrow their childhood tendencies so much as they effortfully overcome them when engaging in mind perception. Of course, acquiring a capacity and using it in everyday life are different things. How adults use their fully formed capacity for mind perception, how the surrounding environment enables or disables people's ability to reason about other minds, and how mind perception shapes social life are precisely the kinds of questions social psychologists care the most about. The rest of the chapter provides at least a partial answer to each one.

## USING MIND PERCEPTION

Oliver Sacks (2003) wrote a vivid account of what it is like to go blind later in life and unintentionally provided a revealing example of everyday mind perception. In this account, Sacks described two extreme outcomes following adult-onset blindness, one in which people lose their sense of the visual world altogether and another in which they develop a heightened sense of the visual world through extremely vivid and detailed mental imagery. Sacks was describing a person from this latter vivid imagery group whose carpentry skills had become so proficient that he was able to replace all of the roof gutters on his house single-handedly. This man reported that his neighbors were understandably startled to see a blind man doing carpentry work on his roof, but that they were *especially* startled when they saw him working in the dark of night.

This heightened startle comes from the reflexive ease of imagining *oneself* on the roof in the dark of night. But startles are fleeting, and this reflexive egocentrism is subsequently replaced by the recognition that darkness is no trouble for a man without functioning eyes to see it.

This example illustrates both major pieces of information people can use when reasoning about other minds, as well as the process underlying mind perception that is observed over the course of years in children and over the course of moments in adults. Understanding another's differing mental states, for the young and the old alike, may first require overcoming one's own.

These two sources of information—one's own mental states or experience and differentiating information about other minds, such as causal theories or stereotypes—have been the backbone of psychological theories designed to explain the underlying mechanisms that enable mind perception. *Simulation* theories have posited that people reason about other minds by using themselves to simulate and reason about others' mental states, whereas inferential theories—usually encompassed by the umbrella term *theory theory*—have posited that people reason about other minds like intuitive scientists, using a theory of how minds work to make inferences about others' mental states independent of one's own psychological perspective.

The debate between simulation and theory theory accounts of mind perception began like many in psychological science, with proponents staking out extreme positions that mind readers use only one source of information or the other. The years of accumulating research have not been kind to strict adherents of either position. This debate is therefore resolving like many others in psychological science, with hybrid models suggesting that people use both simulation and theory-driven inference in varying degrees, depending on the situational context and the perceiver's processing capacity or motivational state. These theoretical accounts have morphed so extremely and complexly over time that any attempt to characterize them invariably misses subtleties across them. None of the evidence presented in the following paragraphs is completely consistent with one theoretical proposition and completely inconsistent with the other, and the empirical tussle has produced many glancing blows without a single knockout. Our approach is therefore to review evidence at least broadly consistent with each general mechanism and then to describe recent integrative accounts that we believe are likely to be more comprehensive, more accurate, and more useful for understanding how people reason about other minds in everyday life.

### Mechanisms of Mind Perception

#### *Simulation Theories*

The intuitive solution to the other minds problem is to use one's own mind to simulate another's mind. As Russell (1948, p. 483) argued, "The behavior of other people is in many ways analogous to our own, and we suppose that

it must have analogous causes." This argument from analogy has such a long history (Hume, 1739/1958; Mill, 1872/1974; Ryle, 1949; Wittgenstein, 1953) that philosophers defending it in the 1960s were already feeling somewhat apologetic—"To some it may seem like I am flogging a dead horse" (Slote, 1966, p. 341). After all, Kant (1781/1953, p. A353) had nearly two centuries earlier called the tendency for analogical reasoning about others to be "obvious."

Psychologists in the 1960s were just getting started, however, in refining a descriptive account of the process by which one's own mental experience might be used to solve the other minds problem and were doing so in the face of attacks from alternative models that were decidedly less "obvious." Floyd Allport had introduced the term "social projection" in 1924 to describe the positive correlation between students' reports of their own cheating behavior and their estimates of others' cheating (Allport, 1924; see also Katz & Allport, 1931), but formal accounts of how the mechanism underlying such projection might operate did not emerge until considerably later. The culminating efforts that appear to have sparked subsequent research occurred in 1986, when Heal, Gordon, and Humphrey independently refined philosophy's argument from analogy by proposing that adults understand others' mental states through a process of first-person simulation (or what Heal called "replication"). By this account, people need not acquire any abstract or inferential theory of mind but can instead understand others' mental states by imagining what *they* would think, desire, or intend if they were in the same situation and then projecting the results of this simulation onto the target (Harris, 1992). "We could . . . imagine what it's like to be [others]," Humphrey wrote (1986, pp. 71–72), "because we know what it's like to be ourselves [and] make sense of [others'] behavior by projecting what I know about my mind into them." This approach essentially turns the philosophical version of the other minds problem on its head—people can reason about others' mental states precisely *because* they have first-person access to their own mental states.

The term *simulation* is no accident; it specifies when this process is likely to be used and when it is not. Simulations are useful for understanding a system when the actual experience is impractical or imprudent. The likely behavior of a skyscraper in a windstorm, for instance, can be understood by building a small-scale model and turning on a fan, or the likely effects of a medical treatment on humans can be understood by giving the treatment to rats instead. In the absence of any direct perceptual information about another person's mental states, people may opt to simulate another's mental states by using one's own mental states. For instance, the consistent introspective experience

that one's own thoughts precede one's behavior can lead to the causal inference that thoughts cause actions, even if the actual neural sequence of events occurs in precisely the opposite direction (Wegner, 2002). This resulting experience of intentional causation and free will can then be used to infer that others' behavior is caused by their inner thoughts as well.

A classic objection to the argument from analogy is that people can viscerally imagine all sorts of experiences that they have never directly experienced themselves, such as the pain of having a nail driven into one's eye or the terror of being buried alive. These simulation accounts, however, do not require that people simply project their own past experience onto others but rather that people possess the ability to imagine their experiences in another state and use the output of that simulation as a proxy for others' mental states (Goldman, 2008). The ability to imagine an event through fantasy and pretense without actually having to experience it is surely on the list of humans' most desirable capacities (Hegarty, 2004), enabling people to efficiently understand and learn about events without taking the time or risking the danger of living through all of them.

Of course, simulations are useful only when they are good analogues for the target or system to be understood. Giving drugs to rats to simulate their effects on humans makes reasonable sense; giving drugs to robots for the same purpose does not. People should therefore naturally use their own experience and simulation abilities to reason about others who appear similar on relevant attributes to the self and should be less inclined to do so to reason about others who seem different from the self. In the presence of a person or agent perceived to be similar to oneself, and in the absence of any other individuating information, using one's own introspective experience as a guide may not only be a perfectly rational thing to do (Krueger & Acevedo, 2005), it may be the only possible thing to do (Dawes & Mulford, 1996). Although this moderating factor of similarity was not an explicit feature in original accounts of simulation theories, it was at least implied by the logic of the theory itself. Simulation may therefore be most usefully characterized as just one tool or heuristic that people have at their disposal for reasoning about other minds, one that is likely to be used more extensively in some contexts, overridden in others, or sometimes avoided entirely.

At least four classes of findings are commonly cited as evidence for a simulation-based mechanism. First, mind perception exhibits systematic biases consistent with a simulation mechanism. Chief among these are that inferences about others' mental states—including goals, intentions, emotions, attitudes, beliefs, and knowledge—are often egocentrically biased (see Alicke, Dunning, & Krueger,

2005, for a review). Consider just a few examples. In general, people use their own knowledge as a guide to others' knowledge, leading people to believe that others' attitudes and beliefs are relatively similar to their own (Alicke & Largo, 1995; Babcock & Loewenstein, 1997; Krueger & Clement, 1994; Ross, Greene, & House, 1977). People who own an object, for instance, tend to value it more than people who do not (Kahneman, Knetsch, & Thaler, 1990), and owners therefore tend to assume that nonowners will value the object more than nonowners actually do (Loewenstein & Adler, 1995; Van Boven, Dunning, & Loewenstein, 2000). Conceptually identical egocentric biases also emerge when people evaluate distant versions of themselves in the future and past, with people inferring their preferences, beliefs, and attitudes in the future and past based on those mental states in the present (Eich, Reeves, Jaeger, & Graff-Radford, 1985; Fischhoff, 1975; Goethals & Reckman, 1973; Hawkins & Hastie, 1990; Loewenstein, O'Donoghue, & Rabin, 2003; McFarland & Ross, 1987; see also Bernstein, Atance, Meltzoff, & Loftus, 2007). Anyone who has been confident of never being hungry again immediately after eating a big meal has directly experienced the ease with which one's current state can be used as a guide to one's future states (Gilbert, Gill, & Wilson, 2002; see Loewenstein, 2005, for a review). This egocentric "curse of knowledge" (Camerer, Loewenstein, & Weber, 1989) also emerges in people's tendency to overestimate the extent to which others can identify their hidden emotions, preferences, and intentions (Cameron & Vorauer, 2008; Gilovich, Savitsky, & Medvec, 1998; Keysar & Barr, 2002; Kruger, Epley, Parker, & Ng, 2005) and in their tendency to use private self-evaluations as a guide for how they will be evaluated by others (Chambers, Epley, Savitsky, & Windschitl, 2008; Gilovich, Kruger, & Medvec, 2002; Kenny & DePaulo, 1993). Simulations produce outputs dependent on features of the simulating mechanism itself, and all of these results suggest that attempts to understand others' mental states depend critically on self-centered inputs from one's own mental states.

Second, simulations can be revealed not only in the systematic features that are present in the outputs of mind perception but also in the features that are absent. Mental simulations differ in several ways from actual experience (Gilbert & Wilson, 2007), but one especially distinctive way is that simulations are relatively timeless. Whereas experience occurs in real time, mental simulations unfold in an instant. Try, for example, to imagine how happy you would feel spending a week on vacation in Hawaii. If we were welcoming you back to this sentence only moments later rather than a week later, you get the point. Indeed, people's inability to accurately incorporate the conse-

quences of time into their evaluations is widely documented in people's predictions of their own and others' future feelings and preferences (Ratner, Kahn, & Kahneman, 1999; Read & Loewenstein, 1995; Wilson & Gilbert, 2003), as well as in the recollection of mental experiences such as pain and suffering (Ariely, 1998; Fredrickson & Kahneman, 1993; Redelmeier & Kahneman, 1996; Schreiber & Kahneman, 2000). Simulations are often insensitive to the actual time that characterizes extended human experience, and people's assessments of other agents' mental states often appear to be relatively insensitive to time as well.

Third, people are often egocentric when considering other agents' mental states, but not universally so. Both behavioral and neuroimaging evidence suggest that the perceived similarity between oneself and a target moderates the extent to which people use themselves as a guide to others. In one experiment, for instance, Columbia University students predicted the preferences of a University of California at Berkeley student. The more similar participants felt to UC Berkeley students in general, the more they relied on their own preferences to estimate the preferences of a particular UC Berkeley student (Ames, 2004b). In a more recent neuroimaging experiment, neural regions associated with self-referential thoughts (especially the ventral medial prefrontal cortex) were activated when participants reasoned about the mental states of a person perceived to be similar to themselves but not when they reasoned about a person perceived to be different (Mitchell, Macrae, & Banaji, 2006). More broadly, the extent to which a target looks like or moves at the same pace as a human moderates the extent to which people attribute humanlike mental states to both human and nonhuman targets, at least partly explaining why hummingbirds and sloths seem relatively mindless compared with more humanly paced horses or lions (Morewedge, Preston, & Wegner, 2007). Not only does perceived similarity appear to increase the tendency to use oneself as a source of simulation, but the opposite occurs as well: Being explicitly asked to simulate another person's perspective and put oneself in another's shoes increases the perceived similarity between self and other (Davis, Conklin, Smith, & Luce, 1996; Galinsky et al., 2005), the amount of empathy viscerally experienced for another person (Batson, 1998), and the amount of self-referential thought engaged (Ames, Jenkins, Banaji, & Mitchell, 2008; Davis et al., 2004). Adopting another's perspective even leads people to behave in ways that are consistent with the stereotypes associated with a particular target (Galinsky, Wang, & Ku, 2008). People seem to egocentrically simulate others' mental experience when they perceive others to be similar, and they become more similar to others once they have simulated others' mental experience.

Finally, people appear to simulate others' experience not only in their mind but in their whole bodies as well. As already mentioned, the tendency to mimic others' behavior can be observed as soon as mothers allow psychologists to examine their infants (Meltzoff & Moore, 1977, 1983, 1994). Adults maintain this tendency, mimicking others' actions such as yawning (Platek, Critton, Myers, & Gallup, 2003) or face rubbing (Chartrand & Bargh, 1999). Those who are dispositionally inclined to engage in perspective taking (Chartrand & Bargh, 1999), or who are especially motivated to form a social connection with another person (Lakin & Chartrand, 2003; Lakin, Chartrand, & Arkin, 2008), are also the most likely to mimic others' behavior. For instance, those who are not in a committed romantic relationship are more likely to mimic an attractive opposite-sex partner in an interaction than those who are in a committed relationship (Karremans & Verwijmeren, 2008). This mimicry not only makes others' behaviors contagious but makes their moods, emotions, and attitudes contagious as well (Neumann & Strack, 2000; for reviews, see Hatfield et al., 1994; Semin & Smith, 2008). Disabling a person's ability to mimic another's behavior also seems to impair one's ability to recognize the mental states associated with that behavior. In one experiment, for instance, participants asked to bite down on a pen were less able to detect changes in others' emotional expressions than those who could move their mouths freely (Niedenthal, Brauer, Halberstadt, & Innes-Ker, 2001). Participants in another experiment were less able to accurately identify happiness in another's facial expression when biting on a pen that specifically disabled the ability to smile (Oberman, Winkielman, & Ramachandran, 2007; see also Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). Mental states can be produced by actions, and copying others' actions provides a plausible mechanism for copying their mental states.

Recent neuroscientific evidence suggests that such mimicry may even occur without overt behavioral imitation. We doubt that Hume (1739/1958, p. 365) was thinking literally when he wrote that "the minds of men are mirrors to one another," but it appears that mimicry may indeed result from specialized neural circuitry that mirrors others' actions (see Rizzolatti & Craighero, 2004, for a review). Because virtually all humans object to having probes inserted into their brains, direct evidence of these "mirror neurons" comes at this point only from macaques in whom a nontrivial percentage of cells (roughly 10% to 15%) in the premotor cortex become active both when they are performing an action (e.g., reaching for food) and when they are observing the same action performed by others (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Keysers et al., 2003; Rizzolatti, Fadiga, Gallese, & Fogassi, 1996).

These mirror neurons are more active when others are performing intentional actions (e.g., reaching toward food) than when performing unintentional actions (e.g., the same reaching behavior in the absence of food; Fogassi et al., 2005; Umilta et al., 2001).

More indirect evidence for a highly complex mirror neuron system in humans comes from less invasive techniques of functional magnetic resonance imaging and electroencephalograms showing similar activation for performing versus observing intentional actions (Buccino, Binkofski, & Riggio, 2004; Buccino et al., 2001; Decety et al., 1997; Iacoboni et al., 2001) and for experiencing versus observing emotions (Jabbi, Swart, & Keysers, 2007). This mirror system is involved not only in simulating the actions of human agents but also in simulating the actions of non-human agents such as robots and simple shapes (Gazzola, Rizzolatti, Wicker, & Keysers, 2007; Wheatley, Milleville, & Martin, 2007). Because simulating others' mental states requires matching representations of the self with representations of others, these mirror neurons may provide the neural architecture for this exact matching function in mind reading and serve as the mechanism that enables empathy with others (Ferrari et al., 2006; Gallese & Goldman, 1998; Gallese, Keysers, & Rizzolatti, 2004; Rizzolatti, Fogassi, & Gallese, 2001).

Discovery of the mirror neuron system is recent, and enthusiasm for potential implications is vastly outpacing empirical support for them (Saxe, 2005; Southgate & Hamilton, 2008). Many implications of the mirror neuron system for broader social functioning remain highly speculative, and their direct links to mind perception have not yet been demonstrated. Adult macaques, for instance, do not appear to engage in overt behavioral mimicry even though they possess mirror neurons (although infant macaques mimic in the first days of life; Ferrari et al., 2006), nor is there strong evidence that macaques can represent others' mental states. Research establishing the connections among mirror neurons, mimicry, and mind perception will likely fill psychology journal pages for years to come.

Nevertheless, these emerging findings in neuroscience, along with long-standing evidence of egocentric biases in judgment, moderation of self-referential reasoning by perceived similarity, and behavioral evidence of mimicry, make it clear that people at least sometimes understand others' mental states through a process of simulation. When Slote (1966) worried that other philosophers would perceive him as "beating a dead horse," it was not because simulation in mind perception had been conclusively demonstrated but rather because its validity as a logical form of reasoning had been so widely and thoroughly attacked by other philosophers (Plantinga, 1966). Psychological research has not so much revived this particular dead

horse as shown that its appeal to ordinary perceivers as a psychological mechanism for knowing other minds was never in much doubt.

### *Theory Theories*

An account of mind perception based only on simulation seems to echo Piaget's assessment that people possess only a "protoplasmic consciousness unable to make any distinction between the self and things" (1929, p. 235). But Piaget was talking about 2-year-olds. What makes adult mind readers remarkable is not their ability to perceive similarities between themselves and others but rather their ability to perceive differences. The developmental trajectory described earlier is marked by impressive changes in the ability to recognize that others' mental states are different from one's own, that the self is distinct from others, and that people's overt behaviors may be deceptive and therefore inconsistent with their underlying beliefs. As adults, the self is defined by features that make it different from others (e.g., needs *Sports Illustrated*, has fishing poles, likes sauerkraut) rather than by the features that make it similar to others (e.g., needs oxygen, has arms, likes money; Kihlstrom et al., 1988; Markus & Sentis, 1982). If the self is a tool that is used to simulate similar others' mental states, then it might not come in handy as often as one might suspect.

One way to explain these changes is that people learn how other minds work over time and acquire an intuitive understanding of psychology, just as a scientist learns about a topic under study by testing hypotheses and attending to available evidence (Churchland, 1984). People do not understand others' behavior on these theory-driven accounts by imagining themselves in another's shoes and simulating the mental states that would result—an egocentrically based process. Rather, they use an intuitive theory of mind that explains behavior in terms of underlying mental states—an allocentrically based process (Flavell, 1988; Gopnik, 1993; Leslie, 1987; Perner, 1991). People learn that their mothers are to be trusted but their politicians are not, and they use their existing knowledge about these targets to predict their goals, intentions, preferences, or other mental states rather than using an egocentrically based simulation. The content of these theory-driven inferences can come through observations of others' actions, interpretations of one's own actions, or culturally conferred stereotypes and associations that form the basis of knowledge about the relationship between mental states and behavior. Understanding the mental states of other agents is no different on this account than any other kind of inferential reasoning that posits invisible forces such as goals or gravity to explain observable actions such as fighting or falling (Baker, Tenenbaum, & Saxe, 2008).

This proposition is old news to social psychologists. Theories of person perception have long proposed the same idea—that people understand an actor's intentions and the behavioral dispositions that are likely to result by either implicitly or explicitly performing a causal analysis of the person's behavior based on individuating or categorical knowledge. Indeed, the entire history of research on causal attribution in social psychology posits theory-driven processes of inference to make sense of oneself and others (Bruner & Tagiuri, 1954; Gilbert, 1998; Jones, 1990; Macrae & Bodenhausen, 2000). Understanding other people's momentary mental states, as well as their enduring dispositions, requires attention to a person's behavior across time and situations in comparison with other people's behavior. These causal attribution theories proposed that people attend to covariation between an actor's behavior and its consequences to reveal underlying intentions, in which unconventional or unique behaviors (i.e., noncommon effects) were the most likely to reveal unique and informative intentions about the person (Jones & Davis, 1965). Stable behavioral dispositions that distinguish one person from another are revealed by a more complicated test (a three-way analysis of variance, in fact) that considers the extent to which a person's behavior occurs only in the presence of a particular stimulus or entity (its distinctiveness), occurs consistently over time in the presence of the same stimulus or entity (its consistency), and is similar to others' behavior in the same circumstance (its consensus; Kelley, 1967, 1973).

As with simulation accounts, several classes of findings are broadly consistent with this theory-driven account of mind perception. First, when introspective signals are weak or ambiguous, people appear to reason about their own mental states by using the same process of theoretical inference that they use to reason about others (Bem, 1972; Gopnik, 1993; Karniol, 2003; Nisbett & Wilson, 1977; Ryle, 1949). People presume, for instance, a consistent correspondence between a person's beliefs and their resulting behavior (e.g., she said she loved me because she *really* loves me), and decades of research shows that people are inclined to draw this correspondent inference even when alternate causal explanations are available (e.g., a preceding plea to "just tell me you love me"; Gilbert & Jones, 1986).

People under certain conditions exhibit this correspondence bias when observing their own behavior as well (Gilbert & Gill, 2000). If, for instance, people are induced through subtle experimental manipulation to behave in a way that is inconsistent with their previously expressed (but easily forgotten) attitudes, people change their own attitudes to be consistent with their behavior. People make the same kinds of inferences about another person's underlying beliefs (Bem & McConnell, 1970). Because people's

inferences about the causes of their own actions sometimes follow the same set of logical inferences made about others, it is reasonable to presume that mental state inferences are often based on the same process of theoretical inference. "The way the mind seems to its owner is the owner's best guess at its method of operation, not a revealed truth" (Wegner, 2005, p. 33). If putting oneself in one's own shoes requires some theoretical guesswork, then surely putting oneself in another person's shoes does so as well.

Second, adults' ability to reason about the consequences of others' false beliefs provides evidence consistent with a theory-driven account of mind perception (for reviews, see Malle, 2005; Saxe, 2008). Children's ability to explain another's actions in terms of underlying mental states (e.g., a false belief) seems to precede their ability to accurately predict another's behavior based on false beliefs (Amsterlaw, 2006), suggesting that an intuitive understanding of mental states precedes the ability to predict the behavioral consequences of them. Among adults, neuroimaging suggests regions specifically dedicated to reasoning about others' beliefs. Although early evidence suggested a wider network of regions involved in theory-based mental inferences, accumulating evidence suggests that the temporoparietal junction bilaterally is the most selectively active region for solving false belief tasks in particular (Saxe, 2008). This region is also selectively active when people listen to a story focused on another person's inner thoughts (e.g., a belief) compared with other inner attributes such as their bodily states (e.g., hunger or sickness) or their outer appearance (e.g., tall or thin; Saxe & Powell, 2006, but see Mitchell, 2008, for an alternative interpretation).

Finally, people do not rely on egocentric simulations when reasoning about others who are different from them; instead, they rely on individuating or categorical information (Krueger, 1998; Vorauer, Hunter, Main, & Roy, 2000). For instance, asking people to write about the ways in which they are different from the average MBA student increases the use of stereotypes about the average MBA student to predict this target's preferences, and diminishes the use of one's own preferences (Ames, 2004a, 2004b). The number of articles reporting the pervasive influence of stereotypes in social judgments is now so extensive that it is more easily weighed than counted, and receives considerable treatment in other chapters of this handbook (Dovidio & Gaertner, volume 2; Fiske, volume 2; Macrae & Quadflieg, this volume; Yzerbyt & Demoulin, volume 2). Although stereotypes are not exclusively used to make mental state inferences, they are the kinds of representations that can be used to make theoretical predictions about them and are therefore consistent with theory-driven accounts of mind perception.

## Integrative Accounts: Mind Perception as Inductive Inference

Whenever opposing sides of a scientific dispute generate so much evidence and so little resolution, it is a good guess that participants in the debate are talking past each other rather than to each other. Classic debates in psychology about nature versus nurture, motivation versus cognition, and dissonance versus self-perception invariably end not by one side beating the other into submission but rather by delineating territory to understand the domains in which each set of forces is likely to operate. Luckily for progress in understanding mind perception, the entrenched either–or debates about a single underlying mechanism are giving way to calls for integration (e.g., Apperly, 2008; Keysers &Gazzola, 2007; Mitchell, 2006) and even a few suggestions for how to do so (Ames, 2004a; Epley, Morewedge, et al., 2004; Keysar & Barr, 2002; Malle, 2005; Mussweiler, 2003; Nichols & Stich, 2003; Saxe, 2008; Zaki & Ochsner, in press). People appear able to use both simulation and theory-driven strategies for solving the other minds problem. The trick for psychologists is to understand when people adopt one, another, or some combination of both.

One promising integration is to recognize that reasoning about other minds represents a more basic process of induction, whereby people reason about unobservable mental states in others by starting from an inductive base of readily accessible knowledge. Like any process of induction, mental state reasoning should be guided by the basic cognitive operations of knowledge activation and subsequent application (Gilbert & Hixon, 1991; Higgins, 1996). This latter application stage includes attempts to correct or adjust an intuitive response in light of less accessible information also activated at the time of judgment. Such correction processes are notoriously difficult, requiring mental effort (i.e., executive control) to integrate information, test alternatives, or inhibit a highly accessible default (Gilbert, Pelham, & Krull, 1988). As a result, inductive inferences are consistently biased in the direction of the most readily accessible information. Such dual process accounts have dominated theories of human judgment in social psychology because they have proven fruitful in explaining judgments that seem to be based on a combination of intuitive and reflective responses, as well as the systematic biases in judgment that result (e.g., Chaiken & Trope, 1999; Epley, Keysar, et al., 2004; Gilbert & Malone, 1995; Kahneman & Frederick, 2002; Lieberman, Gaunt, Gilbert, & Trope, 2002).

Dual-process models appear useful for reconciling when people are likely to use their own mental states and experiences as a guide to others' momentary and transitory mental states rather than using their developed theory of mind based on known attributes about others. In particular,

several findings suggest that egocentric simulation can be a default mechanism for predicting others' mental states, activated automatically and only subsequently adjusted to accommodate for perceived differences between self and others. The reason is that one's own perspective is not simply a source of analogy for other minds but is also the source through which people construct and understand *reality* (Asch, 1952; Krech & Crutchfield, 1948). People see the world through their own eyes, experience it through their own senses, and have ready access to their own knowledge and attitudes. These inputs are distinctly perspective bound, and they influence how people understand and interpret their perceptions or how people imagine and construe events when direct perceptual inputs are absent (e.g., when imagining hypothetical or future events compared with directly observing another's behavior). These top-down influences work automatically and reflexively, enabling a person to understand an otherwise ambiguous action at the time that an event is encoded but leaving no trace of its effects. As a result, people tend to be *naïve realists*, assuming that their own perceptions are an objective reflection of the way the world *is* rather than merely a reflection of the way the world *appears to them* (Ross & Ward, 1996).

If mental states are produced by people's subjective interpretation of reality, then one's own assessment of the real world is a sensible and rational *starting* point for reasoning about others' mental states (Dawes & Mulford, 1996; Krueger & Acevedo, 2005). But adults also learn over the course of development that their own perceptions may be a bad *stopping* point in social judgment because others' perspectives may differ from their own and that their resulting mental states can differ (Epley, Morewedge, & Keysar, 2004; Gilbert & Gill, 2000). In the language of dual-process models, simulation may be an automatic process necessary to characterize an event, whereas using one's theory of mind is a controlled process of correction or adjustment of an egocentric anchor that requires effortful attention, deliberate activation, and intentional control.

Consider, for instance, the paradigmatic test of mental state reasoning—the false belief task: If Sally places her key in a drawer and her sister, Ann, then moved it to the cupboard while Sally is at school, then where will Sally look when she comes back to look for her key? In this task, one's own knowledge differs from the target's knowledge, and people have to rely on what the target knows to predict Sally's behavior. Young children appear to use their own knowledge to simulate Sally's behavior, predicting that she will look in the cupboard. Older children appear to overcome their own knowledge and predict that Sally will look where she believes the key to be. This potential shift from simulation to theory-driven prediction appears to take place

over the course of years in young children, and it suggests that older children adopt a more sophisticated method of reasoning about minds than young children.

This same shift appears to take place over the course of moments in adults. Adults do not seem to outgrow their tendency to simulate others' experience; rather, they develop the ability to subsequently overcome and suppress it when clearly required to do so. Performance on theory of mind tasks in children, for instance, is at least partly determined by the simultaneously developing capacity to inhibit default responses (Carlson, Moses, & Claxton, 2004). In false belief tasks with adults, evidence of egocentric anchoring emerges when more subtle prediction measures are used, such as indicating the likelihood that a target will look in a given location rather than simply being asked where the target will look (Birch & Bloom, 2007). Reasoning about others' differing (false) beliefs also appears to require more effortful cognitive processing than reasoning about others' similar (true) beliefs (Apperly, Back, Samson, & France, 2008), and decreasing people's tendency to engage in effortful thought (e.g., by putting them in a happy mood) increases egocentric biases in false belief tasks (Converse, Lin, Keysar, & Epley, 2008).

Several other findings are consistent with this egocentric default and correction account. For instance, the egocentric biases described earlier in which people tend to use their mental states as a guide to others do not show evidence of complete egocentrism, but are moderated in a direction that suggests an effortful and deliberate attempt to incorporate information about how others' mental states might differ from one's own. People who own an item, for instance, know that buyers are likely to value it less than they do, and buyers likewise know that owners value an item more than they do themselves (Van Boven et al., 2000). These distinctions show evidence of using one's own mental states and evaluations as a guide to others, as well as using theoretical inferences about others' differing mental states that make their own evaluations unique. These results simultaneously provide evidence of egocentric anchoring in the strong correlations between self and other *and* evidence of theory-driven correction in the mean differences between self and other (McFarland & Miller, 1990).

More revealing, however, is that egocentric biases—such as those stemming from the "curse of knowledge"—increase when people are asked to respond quickly, and when they are especially inclined to accept default responses in judgment (e.g., when they are nodding their heads compared with shaking them from side to side), but decrease when people are motivated to engage in additional effortful thought by financial incentives for accuracy (Epley, Keysar, et al., 2004). People also appear to interpret others' spoken language egocentrically and only subsequently

accommodate another's differing perspective. Participants in one experiment, for instance, were asked by an experimental confederate to move objects around a vertical grid (Keysar, Barr, Balin, & Brauner, 2000). Some objects could be seen only from the participant's own perspective, whereas others were mutually visible to the participant and the confederate. On critical trials, the confederate provided an ambiguous instruction that could refer to two objects, one hidden from the confederate and one mutually observable. Results showed that participants tended to look first at the hidden object suggested by an egocentric interpretation of the instruction and only subsequently to look at the mutually observable object suggested by knowledge of the other person's perspective. Highlighting how this process in adults is similar to that in children, an experiment comparing children and their parents using the same eye-tracking paradigm demonstrated that children and adults *did not* differ in the speed with which they interpreted an instruction egocentrically (after correcting for baseline differences) but *did* differ in the speed with which they corrected that egocentric interpretation (Epley, Morewedge, et al., 2004). Adults may not end up solely using their own perspective as a guide to others' mental states, but they may well begin there.

Although people can sometimes appear to be using a combination of simulation and theory-driven mechanisms to make inferences about other minds, they are not necessarily using them in equal degrees across all situations. Factors that increase the tendency to use the self as an inductive anchor in prediction should therefore moderate the extent to which people rely on simulation-based mechanisms centered on one's own perceptions and beliefs versus more theory-driven inferences based on one's developed theory of mind. Perceived similarity to the self is the most obvious determinant. As already mentioned, people use themselves as a source of information when reasoning about similar others, but rely more heavily on stereotypes and categorical information about others who seem to be different from them. When stereotypes about a target are highly accessible, self-relevant information may not be used. We believe it is telling that most demonstrations of egocentric biases consistent with a simulation account involve reasoning about an unspecified or ambiguous target (e.g., the average American, another participant in this experiment, or a fictional character in a story), whereas most demonstrations consistent with theory-based inferences come from contexts in which categorical information about a target is highly relevant and clearly specified (e.g., the target's gender, race, or ethnicity). Without specific information about other minds, simulation is not only a reasonable strategy for inductive inference—it may be the only possible strategy.

## Summary: Using Mind Perception

People appear to use multiple strategies to solve the other minds problem, not only using the self as a source of analogy or simulation but also using theory-driven inferences about how particular minds work. However, determining whether recent attempts to integrate these two sources of information into a more general theoretical model are successful is unfortunately a task for the future rather than for the present. At present, the rapidly accumulating evidence from varying domains suggests that simple solutions to the other minds problem are likely to explain some phenomena but not others, and that a full theory of how people make inferences about unobservable mental states will have to attend to the complexities of everyday life more than to the dictates of Occam's razor. If social psychologists are to be a part of this solution, it will require looking far beyond our usual interests to consider how this process develops and how it varies across species. It will require going far beyond the typical behavioral methods that have defined the discipline to integrate emerging discoveries in neuroscience. It will require retaining a focus on key phenomena in everyday life and using highly controlled experiments to shed light on phenomena that people outside the discipline care about. But most of all, it will require transcending the natural tendency to reason about problems from our own disciplinary perspective in order to integrate a dizzying array of findings emerging far beyond the traditional bounds of social psychology and identify a common language that everyone can understand to discuss it. Despite being the central focus of frenzied activity in psychology for decades, and in philosophy for centuries, the enormous existing literature on how people solve the other minds problem in everyday life does not, as yet, provide a comprehensive solution. It provides a call to action.

## TARGETS OF MIND PERCEPTION

Understanding how a process functions is important not simply for curiosity's sake, but also for application's sake. Social psychologists care about the mechanisms that enable mind perception because they care even more about how people apply this capacity to understand other minds in everyday life and the consequences that result. The mechanisms of mind perception allow people to "see" other minds, but they do not tell us what people will see when they think about those minds. Humans and other animals can appear mindful or mindless, hurricanes can be seen to reveal the mind of God or as random acts of nature, and at times a computer may seem to have a mind of its own. The basic mechanisms of mind perception discussed

in the previous section appear to operate in a relatively similar fashion across various targets, from evaluations of one's own mental states, to the evaluation of other people's mental states, to the evaluation of nonhuman agents such as animals, gadgets, and gods. Research investigating how people assess the mental states of these various targets can be divided into three broad categories—own versus other minds, close versus distant other minds, and human versus nonhuman minds. Although the mechanisms that enable mind perception across each of these distinctions appear to be the same, the way in which they are applied and the outcomes that result are anything but.

## Own Versus Other Minds

The philosophical version of the other minds problem makes a critical distinction between the seemingly direct way people experience their own mental states from the inside and the indirect way people experience others' mental states from the outside. People experience their own minds directly, whereas other minds are inherently invisible and must be inferred using the "outside" mechanisms of simulation and theory-driven inferences. John Locke (1690/1975) suggested that this implied a kind of sixth sense of "introspection" that allows people to perceive their own mental states, and René Descartes (1637/1998) was so convinced that his sixth sense operated truthfully that he staked both his own existence, as well as God's, on it. Introspection provides an intimate look into the deepest parts of ourselves, apparently revealing truths about our mental processes that simply cannot be identified any other way. C. S. Lewis (1952, p. 33) described the common sentiment best when he argued that the self was the only thing "in the whole universe which we know more about than we could learn from external observation . . . In this case we have, so to speak, inside information; we are in the know."

Both Descartes and Lewis were wrong. Descartes was wrong because introspection does not operate truthfully but rather interpretively, making sense of the brain's operation and sensory experiences more than directly reporting on the causes of one's judgments and behavior (Bargh & Morsella, 2008; Nisbett & Wilson, 1977; Wegner, 2002; Wegner & Bargh, 1998). Lewis was wrong because a reliance on introspection to predict one's own behavior from the inside perspective can sometimes be *less* calibrated than predictions based on information observed from an outside perspective (Bass & Yammarino, 1991; Buehler, Griffin, & Ross, 1994; Epley & Dunning, 2000, 2006; Koehler & Poon, 2006; MacDonald & Ross, 1999; Risucci, Tortolani, & Ward, 1989). Although both Descartes and Lewis were wrong about the actual validity of introspection, they were right about its apparent validity

to ordinary perceivers. People tend to rely on introspective access to their own mental states when understanding their own mind, adopting an "inside" perspective, but rely more heavily on observed or recalled behavior when reasoning about others, adopting more of an "outside" perspective (for a review, see Pronin, in press).

For instance, people tend to use their intentions more heavily when inferring their own enduring traits and dispositions than they do when inferring others' traits and dispositions. People may think that they are conscientious for merely *planning* to throw a birthday party, but need to see an actual party to infer that another person is equally conscientious (Kruger & Gilovich, 2004). Explanations of one's own behavior also tend to focus more on unobservable reasons (mental states such as beliefs, intentions, and motives), whereas explanations of others' behavior tends to focus on past behavior (causal histories that explain the progression of one event to another with less focus on inner mental states and experiences; Malle, Knobe, & Nelson, 2007). People also consult their current intentions when predicting their own future behavior (e.g., such as their good intentions to donate to a charity) but tend to rely more heavily on general behavioral base rates or obvious external influences when predicting others' behavior (e.g., such as how often people normally donate in such charity drives or how difficult it would be to donate; Buehler et al., 1994; Epley & Dunning, 2000; MacDonald & Ross, 1999). And because of the general preference for introspection when thinking about oneself, people prefer inside information over outside observation when predicting their future emotional reactions that would enable introspective simulation. When women in one experiment wanted to predict, for instance, how much they would enjoy "speed-dating" a man, they preferred to know information about the man's identity more than to know how much another woman liked her speed-date, even though the latter information produces more accurate predictions than the former (Gilbert, Killingsworth, Eyre, & Wilson, 2009).

Notice that the major cause of the asymmetry in these findings is not so much between self and other as between an inside approach to prediction and explanation that relies heavily on introspective experience and an outside approach that reasons more heavily from observed or presumed behavior (Jones & Nisbett, 1972; see also Kahneman & Lovallo, 1993; Kahneman & Tversky, 1979). As a result, this same asymmetry in attention to introspective mental states arises across other forms of psychological distance, not simply between self and other but also between self in the present and self in the future. Some evidence does indeed suggest that people represent future versions of themselves in ways that are similar to how they represent others, again using introspective experience more when

evaluating themselves or making decisions in the present but focusing more on observable attributes of the situation and context when evaluating themselves in the future or predicting their future behavior (Pronin et al., 2008; Pronin & Ross, 2006).

Although the mechanisms that enable mind perception are designed to help ordinary perceivers narrow the gap between the observability of one's own mental states and the observability of others' mental states, these results make it clear that they are unlikely to close the gap entirely. Empathizing with another's pain, for instance, generates affective reactions consistent with experiencing pain but not the intense sensory stimulation of actually experiencing pain (Singer et al., 2004). This suggests that the other minds problem might pose something of a problem after all: If introspection vividly illuminates the workings of one's own mind, it may in many ways seem "brighter" than the minds of others that are viewed less directly through the mechanisms of simulation and theory-driven inference. If people cannot see others' mental states as easily as they can perceive their own, then they may indeed believe that others have less mind than they have themselves.

Numerous findings converge on this "lesser minds" problem. The most direct comes from studies showing that people believe they possess more mentally complex traits (e.g., "analytic," "imaginative," and "sympathetic") than others do (Haslam & Bain, 2007; Haslam, Bain, Douge, Lee, & Bastian, 2005), possess more complicated moral sentiments than others do (Epley & Dunning, 2000; Heath, 1999; Kahn, 1958; Miller, 1999), and are therefore more likely to be influenced by these secondary emotional states and moral sentiments than others are (Epley & Dunning, 2000; Hsee & Weber, 1997; Koehler & Poon, 2006; McFarland & Miller, 1990; Miller & McFarland, 1987, 1991; Sabini, Cosmas, Siepmann, & Stein, 1999; Van Boven, 2000). People also report that they are better able to reason objectively about the external world and are therefore less biased in their judgment than the more simplistic reasoning of others (Pronin, Gilovich, & Ross, 2004), are better able to resist persuasive appeals and mass media attempts to influence their judgment (Davison, 1983; Perloff, 1993; see also Pronin, Berger, & Molouki, 2007), and are more psychologically responsive to the demands of a situation than are others who are seen as responding more mindlessly on the basis of stable and enduring traits (Kammer, 1982; Nisbett, Caputo, Legant, & Marecek, 1973). People even report that they are more capable mind readers than others, having more insight into other people's "true selves" than others have into their own "true selves" (Pronin, Kruger, Savitsky, & Ross, 2001).

Beyond these self-reported capacities, evidence that others seem to have "lesser minds" emerges from people's explanations of behavior. People tend to explain their own behavior by appealing to more complicated mental states of beliefs and knowledge—more complicated and late-developing concepts in one's theory of mind—whereas they explain others' action by appealing to the more simplistic mental concepts of wants and desires (Malle et al., 2007). People also recognize more complex relations between their own mental states and behavior than they appear to do when explaining others' behavior. When voting in an election, for instance, people can recognize that the correspondence between their belief and actual voting may be complicated—that they can vote for a candidate not because they truly like the candidate (an approach motivation) but rather because they actively *dislike* the opposing candidate (an avoidance motivation). Even when people experience this disconnect between their thoughts and their behavior, they nevertheless assume a simple correspondent relationship in others' behavior—that others vote for a candidate because they like that particular candidate (Miller & Nelson, 2002).

This can, under certain circumstances, create a state of pluralistic ignorance whereby most people assume that their own mental states (attitudes, beliefs, intentions, or goals) differ from the majority of others in a group despite identical overt behavior (Allport, 1924). People may, for instance, privately feel that norms of political correctness have gone too far or that lenient drinking norms on campus are a real cause for concern, but they follow these norms nonetheless because they interpret others' identical behavior in following the norm to indicate that others are actually in favor of the norm (Miller & McFarland, 1987, 1991; Prentice & Miller, 1993; Van Boven, 2000). If introspection enables the observation of complex relationships between one's mental states and one's behavior, its absence leaves relatively simple relationships between mental states and behavior in others, and relatively simpler minds as well.

Some of these tendencies are almost certainly self-satisfying and may therefore appear to stem from the motivation to think well of oneself rather than from the differential access to one's own versus others' mental states and experience. Believing oneself to be more thoughtful, emotionally complex, or behaviorally sophisticated than others is surely better than more thoughtless, simpler, or mindlessly reflexive. But these are not the only inferences that introspection enables. It can also lead people to think that their fear of embarrassment is more intense and crippling than others' (Van Boven, Loewenstein, & Dunning, 2005), that their experience of disgust is more likely to keep them from behaving charitably than others' less intense experience (Pronin et al., 2008), that they are being judged more harshly for a self-deprecating blunder than they actually are (Epley, Savitsky, & Gilovich,

2002; Savitsky, Epley, & Gilovich, 2001), that their own negative intentions have caused more harm than have another person's negative intentions (Pronin, Wegner, McCarthy, & Rodriguez, 2006), or that their own futures are more unpredictable than others' futures (Pronin & Kugler, 2007). More important, increasing access to others' mental states and intentions, or decreasing access to one's own, reliably diminishes the distinctions people make between their own minds and other minds (e.g., Epley & Dunning, 2000; Kruger & Gilovich, 2004; Pronin, in press; Savitsky et al., 2001). Access to one's own mental states may certainly, at times, be self-satisfying, but self-satisfaction is far from a completely satisfying explanation for these results.

More powerful, it appears, is the asymmetry between the direct experience of one's own mind versus the indirect experience of other minds, a gap that no amount of simulation or theory-driven inference can close entirely. When people perceive an object to be dim because they are wearing dark sunglasses, they may fail to fully recognize the influence of the interpretive lens and conclude that the object is dimmer than it actually is (Rock & Nijhawan, 1989). This problem seems to confront mind readers as well. People can perceive others' mental states, but they do so through the darkened lens provided by mechanisms of simulation and theory-driven inference rather than through the relatively bright light of introspection.

### Close Versus Distant Other Minds

Not all other minds are created equal, nor are all other minds equally "other." The relative invisibility of others' mental states appears to increase as the gap between self and other becomes greater across social distance and as other minds are understood from an outside perspective focused on behaviors and actions rather than on an inside perspective focused in mental states and experiences. As the gap between oneself and others grows larger, so does the difficulty of bridging that gap to recognize similar mental states in others.

Many relative differences in how mind readers understand their own mental capacities compared with those of others are mimicked in how people compare the minds of close versus distant others. As already discussed, perceived similarity increases the tendency to use one's own mental states as a guide to others' beliefs, attitudes, and preferences (Ames, 2004a, 2004b; Krueger, 1998; Mitchell et al., 2006), thereby enabling people to use their sixth sense of introspection and their powers of simulation when reasoning about others who are close to the self compared with those more distant from it. The mental capacities attributed to distant others therefore tend to be dimmer than those attributed to close others.

Most evidence consistent with this conclusion comes from differences in representations of, and mental capacities attributed to, ingroup versus outgroup members. Compared with more distant outgroup members, ingroup members are seen as more capable of experiencing secondary emotions that require higher-order mental states such as love, hope, contempt, or resentment (Demoulin et al., 2004; Gaunt, Leyens, & Demoulin, 2002; Leyens et al., 2000) and as more likely to experience the moral sentiments necessary for prosocial actions such as empathy and compassion (Opotow, 1990; Staub, 1989). These mental states are the ones that people perceive to be uniquely human mental capacities (Leyens et al., 2000), and denying these capacities in others strips them of their minds, as well as their humanity (Haslam, 2006). Indeed, members of outgroups can often be represented as animals both through spoken metaphors and through artistic depictions (Goff, Eberhardt, Williams, & Jackson, 2008; Viki et al., 2006). This denial of mind to distant outgroup members, especially in capacities related to agency (e.g., competence) or experience (e.g., interpersonal warmth), is the most prevalent for the most distant outgroups such as drug addicts and the homeless (Harris & Fiske, 2006).

Liking for a target has closely related effects on the attribution of mental capacities, with well-liked individuals being seen as possessing the full catalogue of mental capacities compared with those of relatively disliked individuals, who have relatively lesser minds. People are more likely to adopt the perspective of a liked target than that of a disliked target (Frantz & Janoff-Bulman, 2000), construe their actions in a higher level of abstraction focused on the meaning of an action rather than in its low-level behavioral attributes (Kozak et al., 2006), and believe that liked targets have more well-developed mental capacities (e.g., the ability to experience emotions and intentionally control their actions) than those of disliked targets (Kozak et al., 2006). In romantic relationships, feeling close to another person is related to the feeling of empathic understanding (e.g., Kahn, 1970; Noller & Ruzzene, 1991). This increased perception of mental similarity and self–other overlap increases prosocial actions toward a relationship partner (Aron, Aron, Tudor, & Nelson, 1991), as well as the strength and length of the romantic relationship (Aron, Aron, & Smollan, 1992), even when the perceived similarity in preferences, motives, and beliefs is illusory (Lemay & Clark, 2008; Murray, Holmes, Bellavia, Griffin, & Dolderman, 2002).

### Human Versus Nonhuman Minds

If the gap between one's own mind and other people's minds is large, the gap between one's own mind and

nonhuman minds is immense. But as with other human minds, not all nonhuman minds are created equal. The determinants that induce people to perceive mental states in other humans—from self-propelled action to interdependence to causal uncertainty—operate with nonhumans as well, as do the basic mechanisms that enable the perception of mental states and behavioral traits (Gosling, Kwan, & John, 2003; Kwan, Gosling, & John, 2008). These determinants can make some nonhuman agents appear more mindful than others. The consequences of perceiving mental states in these agents are also qualitatively similar to mind perception with human agents—they increase feelings of social connection and support, enable understanding and apparent predictability, and serve as potent explanations for observed behavior. Because the biological differences between humans and nonhumans are so transparently obvious, we focus not on the perceived absence of mind in nonhuman agents but rather on factors that increase the perceived presence of mind. The awareness that people can anthropomorphize nonhuman agents, attributing humanlike mental states and capacities to them, is at least as old as the sixth century B.C. (Lesher, 1992) and has been a topic of heated debate in intellectual discourse ever since (Broadhurst, 1963; Darwin, 1872/2002; Feuerbach, 1873/2004; Guthrie, 1993; Hebb, 1946; Hume, 1757/1957; Pepperberg, 2002; Povinelli & Vonk, 2003; Ruskin, 1923). Understanding the psychological processes that enable such anthropomorphism, however, is only just beginning (for reviews, see Epley et al., 2007; Kwan & Fiske, 2008; Mitchell, Thompson, & Miles, 1997).

### Biological Agents

The gap between human and nonhuman minds may appear great, but the factors that increase the perception of mental states across nonhuman agents are largely identical. People are more likely to anthropomorphize animals that are similar to humans in either morphology or motion (e.g., Eddy, Gallup, & Povinelli, 1993; Morewedge et al., 2007), and this tendency is moderated by cultural beliefs and practices related to biological agents (e.g., Asquith, 1996; Medin & Atran, 2004; Waxman & Medin, 2007). Factors that increase interdependence with a nonhuman agent, such as the motivation to understand and explain an animal's behavior or to establish social connection (Epley, Akalis, et al., 2008), or the appearance of interdependent and socially responsive action from the agent itself also increase the tendency to perceive mental states in nonhuman animals (Johnson, 2003). Some evidence demonstrates that stereotypes and categorical information about animals, such as the belief that "Rottweilers are vicious," is accessed to make inferences about these nonhuman animals (Kwan et al., 2008) and can act as a prime to influence a person's

subsequent judgment and behavior (Chartrand, Fitzsimons, & Fitzsimons, 2008). The extent to which such inferences are guided by mechanisms of simulation or theory-driven inferences, however, is unclear.

### Technological Agents

Anyone who has noticed a snarl in the grill of a sports car has also noticed engineers' attempts to humanize technology (Welsh, 2006; for a broader review, see Reeves & Nass, 1996). Advances in artificial intelligence have produced robots that can convey emotion (Breazeal & Aryananda, 2002), can recognize emotions and social cues (Breazeal, 2003), and can even imitate human actions and behave interdependently (Breazeal & Scassellati, 2002). These factors can give technological agents the appearance of both mindful agency and experience that would make them seem like moral agents capable of both performing harm and experiencing harm from others (Floridi & Sanders, 2004). Social cues that increase the tendency to think of other people's mental states—such as the presence of eyes and directed gaze, goal-directed motion, and self-propelled motion—also increase the likelihood of attributing humanlike mental states to technological agents or behaving toward these agents as if they had mental states (Guajardo & Woodward, 2004; Johnson, Booth, & O'Hearn, 2001; Woodward, 1998). In one study, the degree of human resemblance in a computerized poker partner (e.g., the presence of a face) was positively related to the partner's perceived intelligence (Koda & Maes, 1996; see also Moreale & Watt, 2004; Nass, Moon, Fogg, Reeves, & Dryer, 1995). In another, a computer-generated agent (specifically, a humanlike face) appeared more trustworthy and persuasive when it matched the participant's ethnicity than when it did not match (Nass, Isbister, & Lee, 2000). These findings suggest that it is relatively easy to attribute at least some humanlike mental states to technological agents and to behave toward these agents as if they indeed possess minds (Reeves & Nass, 1996). This tendency has actually posed something of an unexpected problem to survey researchers using computers to collect data, not because people find it difficult to use such technology but rather because people sometimes respond in a more socially desirable fashion when completing a questionnaire on a computer than when they do so on a piece of paper (Lautenschlager & Flaherty, 1990).

### Supernatural Agents

The perception of anthropomorphic mental states extends not only to materially present agents but also to metaphysical agents such as gods and ghosts. The default representation of God in virtually all religions is deeply anthropomorphic, complete with mental states of intentions, goals, purpose, and emotions (Guthrie, 1993). People

likewise report that ghosts are capable of suffering (Hinde, 1999), capable of being internally motivated (Lillard, 1998), and capable of controlling the actions of humans (Parish, 1991, 1994), despite recognizing the absence of biological states such as hunger or thirst (Bering, 2002). Religious belief appears to come so naturally to people partly because it also appears to be a natural by-product of the near-universal capacity for mind perception that leads ordinary perceivers to identify intentions, goals, and purposes to physical and natural events in the environment (e.g., Atran & Norenzayan, 2004; Barrett, 2000; Bloom, 2004; Boyer, 2003; Gilbert, Brown, Pinel, & Wilson, 2000; Guthrie, 1993). People acquire more specific beliefs from various religious traditions as they age, much like people acquire specific beliefs about other people, but the psychological foundation for belief in supernatural agents appears to be acquired in lockstep with the development of one's theory of mind.

Children through 14 years of age, for instance, are likely to hold highly anthropomorphic representations of God (Heller, 1986; Landy, 2001; Mudge, 1923). Adults are less anthropomorphic but continue to hold subtle anthropomorphic representations that may even conflict with the theological tenets of their reported religious beliefs. For instance, Christianity dictates that God is not embodied in space or time (is omnipresent), has complete knowledge (is omniscient), and has unlimited power (is omnipotent). Christian participants in one study explicitly reported believing that God indeed possessed these properties consistent with theological teachings. When asked to recall God's behavior in various experimental scenarios, however, these same participants reported that God was in only one place at a time, had been mistaken, and had limited power (Barrett & Keil, 1996). All of these inferences were biased memories of the actual stories consistent with an anthropomorphic representation of God rather than a theological representation. Conceptually identical results emerged in a similar study with Hindu participants (Barrett, 1998).

Such egocentric biases also emerge when religious believers are asked to report God's beliefs on important social issues, such as abortion, the death penalty, or support for legalizing same-sex marriages or marijuana. In one series of experiments (Epley, Converse, Delbosc, Monteleone, & Cacioppo, in press), the correspondence between people's own beliefs on these issues and God's beliefs was consistently stronger than it is with other human targets (including liked targets, disliked targets, and "average" others), and manipulating people's beliefs altered their estimates of God's beliefs in a similar fashion more so than for other human targets. A functional neuroimaging study in this same series also revealed that the same regions were active when thinking about one's own beliefs as when reasoning about God's beliefs but that consistent differences emerged when reasoning about the "average American's" beliefs across a series of issues. As with inferences about other people, people use their own mental states as a guide to others unless they have explicit cues to suggest that their own mental states are likely to be fundamentally different from others' mental states.

Even when people are not wholly egocentric thinking about the minds of religious agents, attributes of the self often influence evaluations of God's internal states. In one study, Catholic students with particularly high self-esteem saw God as more accepting, loving, saving, forgiving, and approving, whereas low self-esteem participants saw God as more restricting, controlling, strict, and demanding (Benson & Spilka, 1973). In another, people who reported being particularly lonely also perceived God to be less helpful and more wrathful (Schwab & Petersen, 1990). Conceptually similar egocentric tendencies emerge when people evaluate the mental states of other people as well. Those who are afraid, for instance, perceive a threatening target to be angrier than do those who are not, and men interested in dating a woman tend to perceive her as more sexually aroused than do men not interested in dating (Maner et al., 2005).

As with mind perception more generally, motivations that increase interdependence—such as the motivation for social connection with others—also appear to influence religious representations. Religious agents are generally perceived to be strong sources of social connection and support (Burris, Batson, Altstaedten, & Stephens, 1994; Kirkpatrick, 1999; Luhrmann, 2004), and those induced to feel lonely or isolated report believing in God more than those who are not induced to feel lonely (Epley, Akalis, et al., 2008). People who feel socially disconnected more routinely, such as those who are recently divorced (Cain, 1988), lonely (Rokach & Brock, 1998), or single (Granqvist & Hagekull, 2000), also show an increased tendency to represent God as a socially responsive and supportive agent. Experiencing social loss from the death of a close other also increases the likelihood of forming a connection with God (McIntosh, Silver, & Wortman, 1993; Spilka, Hood, & Gorsuch, 1985; Wuthnow, Christiano, & Kozlowski, 1980).

This research suggests that mind perception is involved in religious belief and experience, but the complexity of religious and supernatural beliefs around the world also makes it clear that mind perception is going to be only one piece of a larger puzzle (Atran, 2002; Boyer, 2001; Wilson, 2002). The power of religious systems to serve as social controls and enable organization (Norenzayan & Shariff, 2008), the capacity for specific religious beliefs to seem simultaneously intuitive and counterintuitive

(Boyer, 2003), the desire for ultimate meaning and fear of death (Norenzayan & Hansen, 2006), and the dynamics of persuasion and influence certainly operate to create the complex and persistent manifestations of religious systems in the world today. How big a role mind perception plays in religious experience, religious beliefs, or the continued popularity of religious worldviews even in modern industrialized societies, compared with all of these other influences, is unknown.

### Summary: Targets of Mind Perception

The mechanisms that enable people to understand other minds appear to operate similarly across various other minds, including other people, past and future versions of the self, and nonhuman agents ranging from other animals to supernatural agents. Social psychology has generally been a person-centered discipline, equating "others" with other people. But social life is richer than that. The overwhelming majority of people living today believe that a mindful God controls their future (Harris Poll, 2003). Rapid advancements in technology means that many people in the industrialized world now spend more of their day interacting with technological agents than they do with other people (Gallegos, 2007). The distinction between human and nonhuman—between us and them—is often central to conflicts over environmental policy, social and cultural practices, ethical conduct of scientific research, and culture wars between religion and science about the origin of our species, among many others. Social psychologists interested in mind perception can contribute more to the world's understanding of social life than simply the study of inter*personal* interaction.

### CONSEQUENCES OF MIND PERCEPTION

Calling research "academic" outside of laboratories and universities is a kind way of demeaning it as irrelevant to everyday life. Research on mind perception is indeed conducted by academics, but its implications and consequences are hardly "academic." Explaining, understanding, and predicting both ourselves and other agents, from people to gadgets to gods, is what much of everyday social thought is all about. Mind perception matters because it is often the critical mediator between others' real or imagine dactions and our reactions or between our current predictions and our subsequent decisions. Although the consequences of mind perception range widely, we wish to focus here on three of the most basic consequences that result from the perceived presence or absence of mind in others. First, mindful agents are capable of reasoned thought and intentional

action and can therefore be held causally responsible for their actions. Second, mindful agents are autonomous agents that can have conscious goals and aspirations but can also suffer and experience emotions that render them moral agents worthy of respect, empathic concern, and the basic human right of autonomy. Third, mindful agents are capable of having thoughts and forming impressions that render them agents of surveillance, who may be evaluating *us* and whose impressions we may try to anticipate, monitor, or influence. Mind matters for judgments of responsibility, for moral agency and ethical action, and for social surveillance (for more detailed treatments of these topics, see Kovera & Borgida, volume 2; Haidt & Kesebir, volume 2; Leary, volume 2; Swann & Bosson, this volume).

### Responsibility

People explain behavior, at least in part, by attending to an agent's intentions. Determining whether an act was intentional or accidental is therefore an important component when determining the causes of a given action and when determining responsibility and blame (Heider, 1958; Malle, 1999). Intentions can create what appear to be intentional (or purposeful) actions when they are combined with the ability to control the action, the desire to attain a particular outcome, a belief that an action will attain a particular outcome, and an awareness of the intention when performing the action (Malle & Knobe, 1997). All of these causal factors reside squarely within the agent and place causal responsibility for controlling the action squarely within the agent (Alicke, 2000). The extent to which agents appear capable of intentional action is therefore directly related to their perceived responsibility for performing the action (Fincham & Emery, 1988; Roberts & Golding, 1991) and their willingness to punish agents for a negative or immoral action (Gray et al., 2007; Hogue & Pebbles, 1997; Kleinke, Wallis, & Stadler, 1992). In times past and cultures more distant, where people did not so naturally restrict intentional capacities to humans, animals (e.g., rats) and objects (e.g., "possessed" statues) were targets of criminal prosecution (Berman, 1994; see also Sunstein & Nussbaum, 2004). Beyond attributing responsibility to others, reducing the extent to which people believe they can intentionally control their *own* behavior appears to diminish their sense of personal responsibility. Undermining people's belief in their own "free will," for instance, increases the likelihood of behaving unethically by cheating on a test or harming another person (Baumeister, Masicampo, & DeWall, 2009; Vohs & Schooler, 2008).

Although intentionality—a guilty mind, or *mens rea*—has been necessary to find a defendant guilty of a crime in most of the world's criminal courts, it is not strictly

necessary for assigning responsibility for most of the world's ordinary perceivers but instead intensifies perceptions of responsibility. We are angered when our neighbor takes our morning paper accidentally, but we are enraged when our neighbor does so intentionally (Alicke, 2000; Heider, 1958; Malle & Bennett, 2002; Weiner, 1995). This "intensification effect" emerges not only in judgments of praise and blame (Malle & Bennett, 2002) but also in intensity of consequences that result from intentional versus unintentional actions. Unintentional sexism makes a person appear somewhat prejudiced, but intentional sexism makes the person appear blatantly prejudiced and discriminatory (Swim, Scott, Sechrist, Campbell, & Stangor, 2003). Unintentional harm seems to hurt another person and is judged to be immoral, but intentional harm is worse (Cushman, 2008; Darley & Shultz, 1990; Kohlberg, 1969). And being unintentionally shocked with electricity by another person hurts, but being intentionally shocked by another person hurts even more (Gray & Wegner, 2008).

Such sensitivity to intentional versus unintentional actions can appear perfectly logical, but these findings suggest that there may be some residual illogic as well because people still show a pervasive and consistent tendency to assign considerable personal responsibility to accidental or unintentional actions (Walster, 1966). People may unreasonably blame victims for their misfortunes (Lerner, 1977; Maes, 1994) or assume that an actor's intentions are consistent with the consequences of an action—especially a negative action—even when the consequence appears accidental (Alicke, Weigold, & Rogers, 1990; Knobe, 2003; Leslie, Knobe, & Cohen, 2006; Mazzocco, Alicke, & Davis, 2004). And anyone who has ever momentarily felt like thrashing the kitchen cabinet for getting in the way of his or her head can appreciate that even mindless objects can seem to perform intentional harm, even if only for a moment (Schultz, Imamizu, Kawato, & Frith, 2004). These less logical findings appear to reflect the more general tendency described already for ordinary perceivers to automatically assume a correspondence between agents' actions and their underlying intentions and dispositions and then discount those default inferences insufficiently for unintentional causes that explain the action (Gilbert & Malone, 1995; Rosset, 2008). This general tendency to infer consistent intentions from observable actions may therefore lead to a greater number of angry neighbors, broken cabinets, and guilty defendants than a purely logical analysis of responsibility would produce (Alicke, 2000).

## Moral Agency and Ethical Action

Fully mindful agents are perceived to have goals and intentions, be capable of reasoned thought and deliberate action, have the ability to consider perspectives other than their own, and experience everything from suffering and regret to compassion and joy. Mental states do not merely grant useful explanations or enable future predictions, they also grant an agent moral worth and value. The most basic of all human rights is the principle of autonomy—that because all people have the same minimal capacity to suffer, deliberate, and choose, no person can compromise the body, life, or freedom of another person. "When moral worth is in question, it is not a matter of actions which one sees but of their inner principles which one does not see" (Kant, 1785/2002, p. 23).

Ordinary perceivers listen to rules from philosophers like teenagers listen to rules from their parents, but this basic principle of autonomy is followed at least somewhat in both moral judgment and moral action. Attributing basic mental states of experience and agency to others confers the basic rights of "personhood" (even to distinctly nonhuman agents) that can engender empathic and altruistic responses, whereas denying those mental states in others appears to be the essence of dehumanization that can engender mistreatment and aggression (Haslam, 2006). How mind perception influences moral value and ethical treatment, however, appears to depend on the mental states being inferred. Perceiving mindful agency (intentions, planning, and deliberate thought) is related to the judgments of causal responsibility and consequent praise or blame for an agent's actions. Perceiving the capacity for mindful *experience* (conscious awareness, secondary emotions, suffering, and pain) appears to guide empathy, compassion, and the willingness to harm or impinge on the basic rights of another agent (Gray et al., 2007). In one study, for instance, people were interested in helping the victims of a massive hurricane to the extent that they perceived those victims to be experiencing secondary emotions such as anguish and remorse (Cuddy, Rock, & Norton, 2007). In another, the extent to which people were dispositionally inclined to attribute humanlike mental states to nonhuman agents also predicted the extent to which it appeared morally wrong to harm a nonhuman agent, such as destroying IBM's legendary computer Big Blue or even trampling over a bed of flowers (Waytz, Cacioppo, & Epley, 2009). And in general, the extent to which an agent has the capacity for mindful experience predicts how unpleasant people report it would be to hurt that agent if they had to do so (Gray et al., 2007).

This connection between mind perception and moral action does not simply influence moral reasoning; it influences moral action as well. Cultures that are especially likely to perceive minds in their surrounding natural environment also exhibit the least harmful ecological practices (Atran & Medin, 2008; Atran et al., 2002). Being

environmentally conscious is partly determined, it appears, by the extent to which a person perceives the environment as *being* conscious. Attending to the mental experience of another agent in pain by actively engaging in perspective taking also increases empathic concern for the agent (including nonhuman agents; Schultz, 2000) and increases the likelihood of behaving altruistically to help an agent in need (for reviews, see Batson, 1994, 1998). Increasing the likelihood of spontaneously considering another's mental experience, such as by increasing the sense of similarity or desire to affiliate, also increases the extent to which people experience empathic concern for another's pain or suffering (Cialdini, Brown, Lewis, Luce, & Neuberg, 1997; Pickett et al., 2004; Preston & de Waal, 2002). The essence of the autonomy principle is to treat other agents as ends in themselves rather than as means to an end, and actively considering others' mental experiences appears critical for producing such treatment.

If mindful experience is critical for treating others with the basic human right of autonomy, then failing to perceive mindful experience in others should lead people to treat others as mindless agents or objects. Indeed, the essence of dehumanization is denying mental states and experiences to others by representing them as either unthinking savages or unfeeling automata (Haslam, 2006; Loughnan & Haslam, 2007). Just as perceiving an agent's capacity to suffer makes harming that agent appear immoral and unethical, denying an agent the capacity to suffer makes aggression and otherwise immoral harm seem permissible (Bandura, 2002). Dehumanizing outgroup members by denying them mindful capacities increases the extent to which violence and aggression toward the outgroup appears acceptable and justified (Castano & Giner-Sorolla, 2006; Goff et al., 2008), increases actual aggression toward the outgroup (Bandura et al., 1975), and increases negative attitudes toward the outgroup (Hodson & Costello, 2007). Some of the most chilling images ever captured on film are of Nazi doctors sitting calmly beside Jewish prisoners amid horrific medical experiments, calmly monitoring humans who had been thoroughly dehumanized to the point of being treated as mice in a laboratory (Spitz, 2005).

Failing to consider an agent's own intentions, goals, or mental experience can also lead to objectification whereby people represent others in terms of their instrumental qualities—how that agent can be used to achieve one's own goals—rather than as a mindful agent with goals, intentions, and desires to be considered. Treating women as sex objects, for instance, involves attending to a woman's physical attributes rather than to her mental attributes (Fredrickson & Roberts, 1997). Some determinants already discussed that reduce a person's tendency to consider another agent's mental states, such as putting a person in a position of power, increase the tendency to objectify others as well (Gruenfeld et al., 2008).

The consequences of mind perception for moral judgment and behavior are not only relevant to everyday interactions among individuals or groups but also feature prominently in societal debates on moral issues including animal rights, euthanasia, the death penalty, and abortion. The importance of mind in these debates is clear:

> Some think it's obvious that a ten-week-old fetus has a mind, and others think it's obvious that it does not. If it does not, then the path is open to argue that it has no more interest than, say, a gangrenous leg or an abscessed tooth—it can be destroyed to save the life of (or just to suit the interests of) the mind-haver of which it is a part. If it does already have a mind, then, whatever we decide, we obviously have to consider its interests along with the interests of its temporary host. (Dennett, 1996, p. 6)

Whether understanding the processes that increase or decrease the perception of mind provides insight into resolving these seemingly intractable disputes remains to be seen, but research on mind perception is beginning to actively inform at least some ethical debates and legal decisions (Rogers & Kaplan, 2004). The Spanish government, for instance, recently extended limited human rights to captive chimpanzees based on research demonstrating their humanlike cognitive capacities (Abend, 2008). Determining how far such influence might extend will require rigorous programs of research that test scientific hypotheses rather than relying on current arguments from anecdotes or intuitions.

## Social Surveillance

Mindful agents have intentions and goals and are thus responsible for their actions, they experience suffering and pain and therefore deserve moral care and concern, but they also have attitudes, hold beliefs, and form impressions. Other minds are therefore sources of surveillance that may be forming attitudes, beliefs, or impressions about *us*. People care deeply about how they are viewed by others (Leary & Kowalski, 1995), attempt to understand and anticipate others' impressions as best they can (Kenny, 1994), and actively try to manage others' impressions through self-presentational strategies (Jones & Pittman, 1982; Leary, 1995). People are especially sensitive to others' negative impressions that might lead to social disconnection or ostracism, and for good reason. Being socially disconnected or ostracized by others is deeply painful (Williams, 2001), increases the incidence of depression and suicide ideation (Heinrich & Gullone, 2006), and decreases the quality of one's health and

the length of one's life (Cacioppo, Hawkley, & Berntson, 2003; Hawkley, Masi, Berry, & Cacioppo, 2006; House, Landis, & Umberson, 1988).

At the most basic level, surveillance by other mindful agents can have two effects on ordinary perceivers. First, monitoring others' attitudes and impressions can be both cognitively taxing (i.e., it consumes working memory resources) and stressful (due to heightened concerns of negative evaluations), thereby influencing performance while under social scrutiny. Monitoring others' impressions increases the attention people pay to themselves and their own behavior in social interaction to discern others' evaluations (Buss, 1980; Duval & Wicklund, 1972; Fenigstein, 1979), and in intergroup interactions monitoring increases the accessibility of stereotypes about how one's own group is likely to be evaluated by other groups (Vorauer et al., 2000).

This increase in self-focused attention can lead people to exaggerate the extent to which they think others are attending to them (Gilovich, Medvec, & Savitsky, 2000), the extent to which they think others' behavior is explicitly targeted at them (Fenigstein, 1984; Zuckerman, Kernis, Guarnera, Murphy, & Rappoport, 1983), and the extent to which they believe their own inner thoughts and experiences are transparent to others (Cameron & Vorauer, 2008; Gilovich et al., 1998; Vorauer & Ross, 1999). At a more extreme level, hyperattentiveness to others' impressions can lead to persecutory delusions and intense paranoia (Martin & Penn, 2001). Emerging research suggests that an overactive theory of mind may be the core mechanism underlying schizophrenia (Abu-Akel, 1999; Abu-Akel & Bailey, 2000; Badcock, 2004; Crespi & Badcock, 2008; Freeman & Garety, 2004).

Actively attending to others' impressions and evaluations also consumes cognitive resources (e.g., working memory) and thus diminishes performance on cognitively demanding tasks, such as solving math problems (Beilock & Carr, 2005) or delivering a speech (Savitsky & Gilovich, 2003). This can disrupt otherwise automatic behavior by increasing conscious attention to the behavior, such as swinging a golf club among expert golfers (see Beilock & Gray, 2007, for a review). These impairments are especially likely in social interactions characterized by the most extreme evaluative concerns, such as in interracial interactions (Shelton & Richeson, 2006; Vorauer, 2006), and are diminished when others are unlikely to be evaluating the self (Bray & Sugarman, 1980; Feinberg & Aiello, 2006; Geen, 1981; Paulus & Murdoch, 1971). In one experiment, participants performed a difficult counting task either in the presence of their friend or in the presence of a dog. Participants had elevated stress responses and poorer performance in the presence of their evaluative friend but not in the presence of the relatively nonevaluative dog (Allen, Blascovich, Tomaka, & Kelsey, 1991). In fact, the presence of one's nonevaluative pet before a stressful experience can have a more positive influence on anxiety and psycho-physical responses to stress than the presence of one's highly evaluative spouse (Allen, Blascovich, & Mendes, 2002). Mindful agents require conscious monitoring, and that monitoring can alter attention, consume cognitive resources, and meaningfully affect behavior.

Second, surveillance from other mindful agents can serve as a source of social control, leading people to behave in more socially desirable and prosocial ways than they would when alone or when not attending to others' evaluations. Imagine, for instance, the things you might do if you were given a cloak that would make you invisible and you will get this point. People behave more desirably to the extent that they think about, and care about, the kinds of impressions they convey to others (Leary, 1995). That mindful surveillance increases socially desirable behavior is clear, but it is especially interesting because such effects emerge even when under the *presumed* surveillance of mindful agents. The essence of many large-scale world religions, for instance, is the constant presence of at least one supernatural agent, an unseen source of social surveillance that can control behavior and enable cooperative social organization. Omnipresent surveillance from a religious agent solves the most basic problem facing any cooperative organization—the difficulty of controlling individuals when a leader or group organizer is absent—and may be the primary reason for the success of religious belief systems across generations of cultural evolution (Irons, 1991; Johnson & Bering, 2006; Johnson & Kruger, 2004; Norenzayan & Shariff, 2008; Sosis & Ruffle, 2004; Wilson, 2002). Priming people with religious concepts, for instance, increases prosocial behavior in a competitive interaction compared with priming them with neutral concepts (Shariff & Norenzayan, 2007). Cross-cultural evidence suggests a positive association between the extent of belief in an evaluative moral deity and the cultural group size (Norenzayan & Shariff, 2008). Beyond surveillance by presumed religious agents, people behave more prosocially while playing an economic game on a computer when it is displaying animated eyes than when there are no eyes (Haley & Fessler, 2005). And participants in one experiment were less likely to cheat on a test in a laboratory after being told by the experimenter that the ghost of a dead graduate student ("Paul") had been seen repeatedly in the laboratory room (Bering, McLeod, & Shackelford, 2005). Mindful agents also appear to serve as a powerful source of social influence and control, increasing adherence to socially accepted norms of conduct whether those others are actually present or merely presumed to be present.

Most parents have told their children to "mind your manners" in the presence of others, and this bit of folk wisdom captures the two most basic effects of social surveillance on behavior—needing to mind or monitor others' impressions and then behaving in a way that is consistent with accepted social norms and conventions. These effects are first-order consequences that result from perceiving the presence or absence of mindful surveillance. Once under mindful surveillance, more complicated second-order consequences arise that stem from the specific thoughts, beliefs, or attitudes that those surveilling minds might possess. In intergroup interactions, the exaggerated belief that one's own group is disliked by the other group increases anxiety in social interaction, diminishes the likelihood of intergroup contact, increases defensiveness once amid an interaction, and ultimately tends to confirm the mistaken belief about the other side's negative evaluations (Cameron, Holmes, & Vorauer, 2009; Shelton & Richeson, 2006; Vorauer, Main, & O'Connell, 1998; Vorauer & Sakamoto, 2006). People also tend to overestimate the extent to which others are motivated simply by their own self-interest, a cynicism that can in turn operate as a social norm and increase people's tendency to behave selfishly themselves (Miller, 1999). Adopting another person's perspective in these cases can actually exaggerate the impact of these mistaken beliefs about others' thoughts and evaluations, further diminishing interest in intergroup interaction (Vorauer & Sasaki, 2009) or further increasing selfishness in a competitive interaction (Epley et al., 2006). Minding your manners may be a more complicated business than your parents would have guessed.

## CONCLUSION

Science is sometimes accused of diminishing people's sense of wonder and amazement by providing sensible explanations for life's deepest mysteries. Scientists illuminating how people reason about other minds, in many ways, are doing precisely the opposite by taking a process that seems so easy that children can do it before tying their shoes and revealing complexity that makes it seem somewhat amazing that anyone can do it at all. Philosophers have recognized this problem, calling into question the ability to conclude that any minds exist other than one's own. Everyone else rolls their eyes at such skepticism because they have acquired the requisite machinery to reason quite easily about other minds. We have sought to explain how people solve this other minds problem with such apparent ease and why people's intuitive solutions to this problem matter so deeply for everyday social life.

A chapter of this length has said much, but it has also left much unsaid. We have said much about how mind perception differs from the broader topics of person perception and social cognition, focusing on inferences about momentary mental states of intentions, desires, motivations, and beliefs rather than on inferences about more invariant and enduring dispositions or traits. This not only represents an increased focus on the initial moments of the causal attribution process that enables people to explain others' behavior and infer more enduring dispositional tendencies but also represents a considerable expansion of research interests to include a more earnest focus on ongoing social interactions, future predictions, and the relation between self and other. The capacity to get inside the minds of others enables not only an understanding of others' actions in the course of a social interaction but also the visceral experience of others' current mental states and foresight into their future actions or experiences. Mind perception is therefore critical to the relational capacities of empathy, compassion, trust, cooperation, and strategic interaction. The tendency to mentalize also goes far beyond perceiving other humans, as people see minds in various biological, technological, and supernatural agents. When Gordon Allport (1968) said that social psychology is "an attempt to understand how the thoughts, feelings, and behaviors of individuals are influenced by the actual, imagined, or implied presence of others," he did not constrain "others" to refer only to other people. Mind perception interprets "others" more generally and is therefore relevant to a rapidly expanding set of topics, including religion, dehumanization, and anthropomorphism.

We have said little, however, about how inferences about momentary mental states relate to inferences about more stable and invariant features of another agent such as dispositions or abilities. That is not because the relation is simple or uninteresting—indeed, more connecting work needs to be done—but rather because that is a topic for another chapter (Gilbert, 1998; Macrae & Quadflieg, this volume). Mind perception tells us about another agent's state at a given moment (what it is currently thinking, feeling, believing, or intending), and these inferences are then shuffled along to the causal calculus of attribution theory and social cognition to tell us what others are like more generally (whether others are generally lazy or lively, bumbling or brilliant, and callous or caring).

We have also said much about how people reason about other minds, focusing on the ability to simulate others' experience by imagining oneself in another's shoes and the ability to make inferences about mental states based on more general theoretical inferences. We have suggested, in line with more recent theoretical accounts, that people likely use both of these mechanisms in varying degrees depending on the context. We believe that thinking of mind perception as a basic process of induction will

help to provide a more integrative account of mental state inferences, but this is a topic of heated debate and frenzied research activity. The coming years of integration will be exciting to those who care deeply about these basic mechanisms and, we hope, clarifying for people who care about the consequences of these mechanisms for everyday social interaction.

We have said little, however, about *how accurately* people make inferences about other minds. At times, this question is unanswerable. Nonhuman animals may or may not *actually* have the mental capacities that people attribute to them. Whether other people *actually* have beliefs or free will has been debated for centuries with little meaningful progress. And knowing the actual beliefs and intentions of religious agents is—well, complicated. At other times the question has too many answers. People in some situations show an amazing ability to accurately intuit others' mental states and at other times seem to have no ability (e.g., Ickes, 2003; Kenny, 1994). A speaker may be reasonably good, for instance, at determining whether a speech was generally liked or disliked by the crowd, but may be no better than chance at determining which audience members actually liked the talk and which did not (Kenny & DePaulo, 1993). When predicting future emotional experiences or even behavioral tendencies, there is often a strong correlation between predictions and reality, but there may be consistent biases that distort everyone's predictions (e.g., Epley & Dunning, 2006; Gagné & Lydon, 2004; Gilovich et al., 1998; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000). And at times people seem to overestimate how similar others' beliefs and preferences will be to their own (Krueger & Clement, 1994), but at other times they tend to underestimate such similarities (Hoch, 1987). A better understanding of the mechanisms that enable mind perception will begin providing better insight into when people are likely to be systematically accurate and when they are not, as well as how to improve accuracy when it would be desirable to do so.

We have also said much about when people are likely to consider other minds and when they are not, suggesting that interdependence is a critical determinant. Factors that increase the need to explain, predict, or understand another agent's behavior are likely to increase the attention paid to other minds, as is the basic motivation to establish a social connection with another agent. The ability to get beyond one's own immediate perspective and imagine what it is like inside the head of another person is surely one of humans' greatest capacities, and interdependence facilitates people's actual use of this capacity.

We have said little, however, about how this capacity to transcend one's own egocentric experience to reason about other minds might be related to other seemingly related capacities and whether mind perception is therefore a small piece of a larger evolved capacity or whether it is a relatively distinct neural module. Not only can people transcend their own skulls to think about other minds, but they can also transcend the present to think about the future or past and they can transcend their current location to imagine themselves moving in another location. These seemingly distinct capacities appear to use the same neural circuitry (Buckner & Carroll, 2007), suggesting that these capacities may be deeply related to one another, and their behavioral consequences might therefore be deeply related as well. Is temporal discounting—underweighting future events compared with current events—related to biases in perspective taking and the tendency to consider others' mental states? Are extreme temporal discounters also inaccurate mind readers? Are the clinical extremes of mind perception— possibly autism on the capacity's low end and schizophrenia on the high end—also related to variability in foresight or spatial reasoning? Does increasing people's future-mindedness also increase their perspective-taking ability? Are religious experiences of transcendence—reasoning about one's ultimate purpose, considering the image of God, or meditative experiences—part of this shared neural network? The brain is a cobbled piece of machinery shaped by specific demands of survival and reproduction. These varied tasks and experiences need not be related to one another. They need not be completely unrelated, either.

We have said much about why mind perception matters to social psychology, but interest in how people understand other minds is now among the dominant research topics in other areas of psychology as well, with our developmental, cognitive, and neuropsychological colleagues actively participating, along with philosophers, sociologists, and biologists. At present, there is insufficient conversation among these groups, and no consistent language enables everyone to understand the rapidly expanding body of findings and how they relate to one another. This is the first chapter explicitly addressing mind perception in this handbook, but we doubt it will be the last. Whether this topic will morph into another, adopt different language to describe itself, or again be subsumed into the broader literature on person perception is unclear. It is, however, unlikely to disappear. There is much left to be said.

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