

Spontaneous Inferences, Implicit Impressions, and Implicit Theories

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Abstract

People make social inferences without intentions, awareness, or effort, i.e., spontaneously. We review recent findings on spontaneous social inferences (especially traits, goals, and causes) and closely related phenomena. We then describe current thinking on some of the most relevant processes, implicit knowledge, and theories. These include automatic and controlled processes and their interplay; embodied cognition, including mimicry; and associative versus rule-based processes. Implicit knowledge includes adult folk theories, conditions of personhood, self-knowledge to simulate others, and cultural and social class differences. Implicit theories concern Bayesian networks, recent attribution research, and questions about the utility of the disposition-situation dichotomy. Developmental research provides new insights. Spontaneous social inferences include a growing array of phenomena, but they have been insufficiently linked to other phenomena and theories. We hope the links suggested in this review begin to remedy this.

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INTRODUCTION

Over the past 20 years, evidence has grown that much, if not most, social behavior is governed by implicit, even automatic processes: implicit attitudes, inferences, goals and theories, and the affect and behaviors they produce (e.g., Bargh 2007, Hassin et al. 2005a). This has transformed our views of how people understand others. During the late 1960s and '70s, research on understanding others focused on self-reports of attributions of causality and responsibility. Then social cognition famously engulfed the field, using person memory paradigms and studies of errors and biases to understand how we process information about others. These approaches continue to yield rich rewards and have become part of normal science in social psychology. More recently, researchers in several other fields (developmental and cognitive psychology, neuroscience, and philosophy of mind) have made exciting theoretical and empirical advances that shed new light on social psychology's oldest questions; these researchers often call their work "social cognition," without reference to social psychology.

Within social psychology, spontaneous social inferences and implicit impressions of others have been widely documented. They occur and affect downstream events without our awareness or intentions. This review surveys the most recent work as well as some of the most important developments in related fields to suggest how they point to new directions for research on implicit impressions. It is beyond the scope of this brief review to consider other important related topics such as stereotyping (Major & O'Brien 2005), emotional intelligence (Mayer et al. 2008), accuracy in person perception (Kenny 2004), and social neuroscience (e.g., Lieberman 2007, Todorov et al. 2007).

IMPLICIT IMPRESSIONS

Implicit impressions of other people are not open to self-report. They include implicit

attitudes toward others, implicit knowledge structures, implicit theories, and implicit behavioral tendencies. Uleman et al. (2005) described the wide range of evidence for the existence of implicit impressions, the ways in which they occur and have effects automatically, how they affect trait judgments of others, how the effects of simultaneous implicit and explicit impressions can be empirically distinguished, and how they may relate to errors in judging how well one knows someone, stereotypes, and ingroup/outgroup perceptions. We update that review in several areas.

Inferences Based on Faces

Faces play a special role in social perception, allowing us to easily distinguish individuals, establish mutual gaze, and infer “social category, identity, emotion, and psychological and physical traits, as well as the interdependence of attributes” (Zebrowitz 2006, p. 663, in Bodenhausen & Macrae 2006). Here we highlight recent findings most relevant to our main theme.

Social categories are extracted from faces very early in processing (Ito & Urland 2003), even when the faces are irrelevant to the task or presented suboptimally (e.g., inverted). But spontaneous categorization of faces may require a conceptual/semantic goal in the focal task (Macrae et al. 2005). Category-based construal of faces seems to be more efficient than identity-based construal (i.e., individuation), and this may underlie people’s heavy reliance on categories in person perception (Cloutier et al. 2005). Personality traits can be inferred after 100 ms exposure to faces, though confidence increases and target impressions become more differentiated with more time (Willis & Todorov 2006). Perceivers’ judgments of competence, after only one-second exposures to pairs of political candidates’ faces, predict real-world election outcomes and margins of victory (Todorov et al. 2005).

Physiognomic information from faces affects interpreting other (verbal) information

about actors (“reading from faces”), and information about actors’ personalities affects perception of their faces (“reading into faces”) (Hassin & Trope 2000). Social categories are read into categorically ambiguous static faces (Eberhardt et al. 2003, Huart et al. 2005) and into dynamic facial expressions of emotions (Hugenberg & Bodenhausen 2003).

Impressions are also affected by subtle facial resemblances. When a connectionist network, trained to distinguish anomalous and baby faces from normal adult faces, was presented with novel normal adult faces, the extent to which anomalous and baby-face output units became activated (i.e., the extent to which the network “confused” normal faces with anomalous or baby faces) predicted human judges’ trait impressions of these faces. The similarity of faces from particular categories (e.g., elderly) to anomalous and baby faces may partially explain stereotypes of those people (e.g., “unhealthy” and “weak,” respectively) (Zebrowitz et al. 2003). Faces with more Afrocentric features attract more attention in the context of African American stereotype concepts (Eberhardt et al. 2004) and are seen to have more stereotypic African Americans attributes, even when they are European American (Blair et al. 2002, Maddox 2004). Since it is subtler, bias based on facial features might be harder to control than that based on categories (Blair et al. 2004).

Inferences Based on Behaviors

Spontaneous trait inferences. Spontaneous trait inferences (STIs) have usually been made from verbal descriptions of behavior, in the lab. For example, Todorov & Uleman (2003) used a false recognition paradigm to examine the automaticity of binding STIs to representations of actors. Participants under memory instructions viewed 60 pairs of actor photos and trait-implicating behaviors (e.g., a woman’s photo with “Alice solved the mystery halfway through the book,” implying that she is clever). Then for a series of photo-trait pairs, they judged whether the trait

Social categories: those extracted most efficiently include age, gender, and race

Spontaneous trait inferences (STIs): unintended, unconscious, and relatively effortless inferences of traits

Probe recognition:

task that asks participants whether a probe word was explicit in the preceding text

Three-stage models:

these propose two automatic stages in which (a) behavior is identified or categorized in trait terms and (b) the actor is so characterized, followed by (c) a controlled attributional inference or correction that takes situational context into account

had been explicit in the sentence with that photo. False recognition rates for implied traits paired with actual actors, relative to other actors, measured STIs. STIs occurred with very brief (two-second) initial exposures, when participants' goal was shallow processing (counting nouns) rather than memorization and when they were under a concurrent cognitive load. These findings suggest that STIs are automatically bound to actor representations.

Ham & Vonk (2003) obtained simultaneous trait and situational inferences from the same participants. Critical sentences (e.g., "John gets an A on the test") implied both traits ("smart") and properties of objects ("easy"). Probe recognition results showed both STIs and spontaneous situational inferences (SSIs). Ham & Vonk (2003, Study 2) used the savings-in-relearning paradigm and asked participants to form impressions of the actor, the situation, or the whole event. Later they learned associations between these implications and abstract cues associated with the sentences. Savings in this relearning task (evidence of prior spontaneous inferences) occurred for both traits and situations. And consistent with earlier findings for STIs, savings were unaffected by goal instructions.

Based on such findings, Ham & Vonk (2003) proposed an interesting integration of spontaneous and intentional inferences in person perception. Multiple (even inconsistent) inferences are made spontaneously in the first stage of the familiar three-stage models of person perception (Gilbert 1989, Trope & Alfieri 1997). In the second stage, goal-inconsistent inferences (if any) are automatically inhibited. Then remaining inferences are intentionally corrected or adjusted in the third stage. More direct tests of this proposal would be useful, especially if they included ambiguous behaviors.

These procedures might suggest that STI only occurs during text comprehension, and not during perception of raw behavior. However, Fiedler & Schenck (2001) showed that viewing static silhouettes of dyads that im-

ply traits (e.g., caring, mean) produces STI. They found shorter response times for identifying degraded trait words when preceded by silhouettes implying these traits. In Study 2, based on the Linguistic Category Model, identifying degraded trait words was preceded by a "verification task" designed to manipulate the level of linguistic abstraction about the silhouettes. Counterintuitively, the largest effect of silhouettes on trait word identification (STI) occurred when the intervening verification task was most concrete, involving direct action verbs rather than state verbs or adjectives. Thus, "focusing on the picture and refraining from abstract semantic interpretations . . . serves to enhance the STI" (Fiedler & Schenck 2001, p. 1543). Other evidence suggested that goals were also spontaneously inferred, even more quickly than traits.

Fiedler et al. (2005) replicated these findings with silhouettes and 15-second film clips. They also demonstrated simultaneous spontaneous inferences about both subjects (agents) and objects in dyadic interactions. The intervening verification task affected all these effects, suggesting that spontaneous encodings can be manipulated in several, sometimes counterintuitive, ways. Thus the verification task's verb type affected the target of spontaneous inferences, and verification "fit" with the dyadic behavior either closed off elaborative inferences (when fit was good) or left them "open" (when fit was poor). This interesting paradigm merits further research, particularly because of the many processes apparently invoked by the verification task that have opposing effects (semantic priming and inhibition, memory processes producing the picture superiority effect, open and closed mind-sets, etc.).

STI is also affected by individual differences such as perceivers' trait hostility and induced anger (Tiedens 2001). Others have used STI to characterize repressors (Caldwell & Newman 2005) and persons with chronic moral concerns (Narvaez et al. 2006). Tormala & Petty (2001) showed that perceivers high in

the need to evaluate are more likely to spontaneously evaluate a target person online. They suggested this finding challenges the ubiquity of STI. However, we value these findings for indicating STI boundary conditions. STI refers to inferring the trait implication of a single (or very few related) behavior(s) and integrating that with the actor representation. As their results indicate, integrating meanings and/or evaluations of one target's many behaviors is less likely to occur spontaneously and requires high levels of relevant chronic goals.

STIs and stereotypes. Stereotypes of actors' social categories affect STIs. Wigboldus et al. (2003) examined how much reading about actors' stereotypic (or counterstereotypic or neutral) behaviors activates the trait concepts implied by the behavior. Stereotype-inconsistent (compared to stereotype-consistent or -neutral) STIs were inhibited. With ample cognitive resources, inhibition of stereotype-inconsistent inferences is attenuated (Wigboldus et al. 2004). Furthermore, processing goals dramatically influence the effect of stereotype-inconsistent information. Gonzalez et al. (2007) found that, as above, spontaneous processing inhibits STIs. But intentional processing (impression formation) produces stronger (more extreme) trait ratings for stereotype-inconsistent than stereotypic or neutral information. This latter effect is consistent with Biernat's (2005) shift-of-standards model, in which social categories shift the meaning of subjective scales, whereas the STI effect fits a simpler spreading activation/inhibition model. Thus, behavior-based trait inferences are influenced by stereotypes, and the direction of influence depends on perceivers' processing capacity and goals, including whether impression formation is spontaneous or intentional.

Spontaneous trait transference and evaluative conditioning. Considerable research has investigated when spontaneous trait transference (STT) does and does not occur, and many differences between STT and STI have

been identified. STT effect sizes are typically half those of STI. Carlston & Skowronski (2005), who discovered STT (Skowronski et al. 1998), proposed that STI entails attributional processing, whereas STT entails mere associations. They asked participants to familiarize themselves with a series of photo-behavior pairs in which those pictured described either themselves or someone else (of the other gender and not pictured). Participants then rated the people in the photos on several traits. Negative behaviors had more impact than did positive behaviors on STIs (from self-descriptions), consistent with attributional processing, but valence did not affect STTs (from describing others), which is more characteristic of associative processing. Study 2 ruled out encoding or retrieval errors as causes of STT, as did Study 3 (Carlston & Skowronski 2005). Study 3 also showed that asking whom the behaviors had described eliminated STT but increased STI. Participants were not affected by warnings to avoid STTs. All this suggests that "perceivers simply associate the informants with the trait implications of those descriptions . . . [which] then have an implicit effect on later impressions" (Carlston & Skowronski 2005, p. 895), and that STT is "unintentional and unconscious" (p. 896).

There are other dissociations. STIs are stronger for targets in low- rather than high-entitativity groups, as if they are more individuated. STT among such group members is weak. But the reverse (weaker STI and stronger within-group STT) occurs for members of high-entitativity groups (Crawford et al. 2002). Carlston & Mae's (2007) participants familiarized themselves with photos paired with trait-implicating symbols (e.g., a flag) rather than sentences. STI but not STT effects were sensitive to the symbols' valence and memorability. Finally, Mae et al. (1999) showed that STT to popular celebrities is unaffected by prior knowledge of the celebrities. It seems likely (although it is untested) that STI is affected by prior knowledge of the actor.

Spontaneous trait transference

(STT): a process wherein one person ("informant") describes another person's trait-implicating behavior, and the trait implication of the behavior becomes associated with the informant

Crawford et al. (2007b) found that when participants' goal was to judge whether the trait-implying behaviors were reported truthfully, STT was unaffected, whereas STI was reduced entirely (Study 1) or almost (Study 2) to the level of STT. In their view, these and prior results suggest that in STT, behavior is categorized in trait terms; this category is associatively linked to informants at encoding, and this linked category is then used to respond to subsequent tasks. In contrast, STI involves inferring that the behavior category reflects the actor's trait at encoding. For some reason, truth detection interferes with such inferences but not with associations. These results also show that STI is surprisingly easy to disrupt, and STI is more goal dependent in this sense than was previously thought.

Does STT depend on the actor being absent at encoding? Todorov & Uleman (2004) showed that false recognition of implied traits is higher when they are paired with actors than when implied traits are paired with others who were also present at encoding. This was true even after a one-week delay as well as when there was equal attention to each photo at encoding and when targets had different physical orientations at test. However, these studies did not assess STT per se. Crawford et al. (2007a) did assess STT and found that when actors and either informants or bystanders were presented simultaneously with behaviors, STT did not occur, but STI did. One possible reason for this is that actors attracted more attention and processing. Unlike the studies of Todorov & Uleman (2004), these studies did not ensure equal attention to both photos at encoding. But Goren & Todorov (2007) ensured equal attention in four studies using false recognition and trait ratings. STT occurred only when actors were absent at encoding. Thus, STIs bind only to actors when they are there, but to other faces when they are not, producing STTs.

STT is a subtle way for informants to influence others' impressions of themselves. Even pairing people randomly with dogs associated

with particular traits affects person impressions (Mae et al. 2004). Observers also attribute informant traits that differ from the direct implications of what informants say by inferring what kind of a person would say such things (Mae & Carlston 2005). Such meta-inferences may also be implicit.

Person evaluations are also subject to associative effects. In the "spreading attitude effect" based on evaluative conditioning, pairing a liked or disliked person (unconditioned stimulus, or US) with a formerly neutral person (conditioned stimulus, or CS) not only causes the CS person to acquire the valence of the US person, but also causes other persons associated only with the CS person to acquire the same valence (Walther 2002). This effect does not reflect cognitive balance, does not depend on awareness of contingencies, is resistant to extinction, and is enhanced under cognitive load. Cognitive balance processes can also affect evaluations of targets described by informants, when perceivers have prior attitudes toward the informants. So both implicit and explicit "attitudes toward targets were more positive when they were liked than when they were disliked by positive source [i.e., informant] individuals. In contrast, attitudes toward targets were less positive when they were liked than when they were disliked by negative source individuals" (Gawronski et al. 2005, p. 621).

Inferences Based on Relational Knowledge

Implicit impressions can be influenced by situationally triggered or chronically accessible relational knowledge. A clear example is the social-cognitive process of transference, in which the mental representation of a significant other is activated and applied to a novel person who bears minimal resemblance to this significant other (for a review, see Andersen & Saribay 2005). This happens unconsciously (Glassman & Andersen 1999). In transference, responses to a new person (e.g., how the new person is evaluated) are best predicted

by the global qualities (e.g., positivity) of the significant-other representation.

Goals in important relationships can also influence perception of strangers. For instance, when people had a goal to understand a close friend and were subliminally primed with the name of this friend, they tried harder to understand a new person, as indicated by more situational attributions for that person's behavior (Fitzsimons & Bargh 2003). (See the review by Chen et al. 2007.)

OTHER SPONTANEOUS SOCIAL INFERENCES

Spontaneous Goal Inferences

Goals can be inferred spontaneously. In a study by Hassin et al. (2005b), participants read goal-implicating sentences and then were given an unexpected cued-recall test, a probe recognition test, or lexical decision trials. Goals were spontaneously inferred, even from behaviors in which goal attainment was blocked (see also Fiedler & Schenck 2001).

Spontaneous goal inferences affect behavior. Aarts et al. (2004) showed that, given the opportunity, people will act on these goals even though they are unconscious and of unknown origin (goal contagion). However, if the inferred goal is unacceptable in some way (e.g., pursued by the actor through inappropriate means), then goal contagion does not occur and the goal is devalued. Goal contagion differs from mimicry (described below) in functioning like primed goals and having similar effects (e.g., Moskowitz et al. 2004). Furthermore, goal contagion can be deactivated through the co-occurrence of negative affect (Aarts et al. 2007).

Spontaneous Counterfactuals and Contradictions

Counterfactuals come to mind spontaneously, especially when events prompt negative affect (Roese et al. 2005) and provide a "but for" basis for inferring causality. Strong sit-

uational constraints prompt counterfactuals about what an actor would have done but for those constraints (Miller et al. 2005), and these influence trait attributions. Though counterfactuals may be triggered by situational cues, their content is also determined by perceivers' preexisting attitudes (e.g., Tetlock & Visser 2000) in ways that support initial attitudes and can serve to reaffirm and strengthen them (Crawford & McCrea 2004).

Actors' characteristics are represented differently when terms for the characteristics' negations come readily to mind (Sam is not warm → Sam is cold) than when they do not (Sam is not creative → Sam is?). This affects how person information is remembered, integrated with new information, and judged on truth-value (Mayo et al. 2004). Consistent with this, Hassin et al. (2005) showed that relations between comprehending statements and judging their truth-value depend on whether their negation is informative. As a consequence, when suspicion or distrust is aroused, words are only more likely to activate their opposites if a logical opposite comes to mind (Schul et al. 2004). Thus, semantic structures, preexisting attitudes and expectations, as well as episodes' logical possibilities constrain the spontaneous generation of counterfactuals and contradictions.

Spontaneous Belief Inferences

One counterfactual prominent in developmental research (discussed below) is false beliefs about the state of the world. Children younger than four years have difficulty representing others' false beliefs about reality while simultaneously maintaining a veridical representation of reality themselves. Apperly et al. (2006) devised an "incidental false-belief task" to see whether adults infer others' false beliefs automatically. Participants watched a visual display of a box and an observer, who was briefly absent while the location of the box was changed, and who then returned. When asked to track the location of the box, participants took longer to indicate where the observer

believed the box was than where it actually was, whereas those who tracked the observer's belief answered both questions equally fast (2.2 s). Given this single test and the multifaceted nature of automaticity, their conclusion that "belief reasoning is not automatic" (Apperly et al. 2006, p. 844) is premature (see below). But this study raises important questions about which mental states are spontaneously inferred, and when.

Spontaneous Value Inferences

People spontaneously infer values relevant to social situations and even cultures. In a study by Ham & Van den Bos (2006), participants read vignettes about just and unjust situations, e.g., arbitrary grading procedures or unequal pay for equal work, and responded to recognition probes such as "just" or "unfair." Spontaneous justice inferences were stronger when the protagonists in the vignettes were personally relevant, i.e., described as "you" rather than "he/she," or "a friend" rather than "a stranger." Most interestingly, explicit justice judgments are not moderated by personal relevance (Ham & Van den Bos 2007). So personal relevance produces a dissociation between implicit and explicit justice inferences.

Fu et al. (2007) used the probe recognition paradigm to show that sentences with strong cultural referents (e.g., "A great emperor once produced an underground army of clay warriors") spontaneously activate that culture's values (e.g., obedience, modesty), even though they lack semantic or personal relevance to the sentence or actor. Bicultural participants not only showed such activations to Chinese and American cultural sentences (whereas Americans showed this only to American sentences), but they also showed rapid cultural frame switching between sentences within the same study session.

Broader Questions

To summarize, when we learn about or observe strangers performing trait-implying behaviors, we unintentionally and unconsciously

(spontaneously) attribute traits (and goals) to them, creating implicit impressions. Though automatic in several senses, this inference process (STI) can be disrupted by some processing goals. It takes account of stereotypes about the actor. It is more complex than merely associating the activated trait category with someone, although this STT-linking process probably contributes to STI effects and has interesting consequences in its own right. Furthermore, relational knowledge activated during person perception affects implicit impressions. Spontaneous social inferences are not restricted to traits and goals.

Of course, we also form impressions of others intentionally. So one important question concerns how spontaneous (largely automatic) and intentional (controlled) processes interact. Other broad dichotomies seem particularly relevant to implicit impressions: abstract versus embodied cognition, and associative versus rule-based cognition (as in STT linking versus STI thinking, respectively). There is important progress on elaborating the (largely implicit) folk psychology that supports inferences about others. Another basic content domain (fundamental to traditional research on causal attribution) concerns causality: what it means, the role it plays in categories central to person perception, and how to model it. Finally, recent research on person perception in children, especially before language, supports symbolic reasoning and offers important insights.

BASIC PROCESSING DICHOTOMIES

Dual-process theories are widespread in social psychology (Chaiken & Trope 1999, Kruglanski & Orehek 2007). In this section, we describe the relevance of some of the most important ones to implicit impressions.

Automatic Versus Controlled Processes

This dichotomy has played a major role in the past 25 years of research in social psychology

(see Andersen et al. 2007 for a review), even though control is only one of the four horsemen of automaticity singled out by Bargh (1994). As the impact of automatic processes extended to more and more phenomena previously considered intentional and controlled (Bargh 2007), some have been prompted to empirically examine the ways in which free will is illusory (Wegner 2005). Of course, this dichotomy is an oversimplification in at least three ways. First, automaticity refers to several features of cognitive processes, and these do not always covary. Second, control in the sense of self-regulation can be automatic and unconscious (Andersen et al. 2007, Hassin et al. 2005a). Third and most important, even when control is intended and conscious, controlled and automatic processes interact. As Jacoby (1991) has long noted, “no tasks are process pure.” There are now techniques for separating effects of automatic and controlled processes on performance in several tasks relevant to person perception, and for modeling their interactions.

Uleman et al. (2005) used Jacoby’s process dissociation procedure (PDP) to separately estimate effects of automatic and controlled processes in using STI-based implicit impressions. This work decomposes not the processes of forming STIs, but rather the processes involved in using STIs and explicit memory for intentional judgments. The PDP involves task performance under two conditions: an “inclusion” condition in which automatic and controlled processes both contribute to optimal performance, and an “exclusion” condition in which they are pitted against each other. The difference in performance in these two conditions provides an estimate of control. Thus, “automatic” means uncontrolled or uncontrollable. Participants rated actors who had previously been studied for a memory test, while paired with trait-implying behaviors that produced STIs. Then in an inclusion condition, they included any prior impression they could access in their trait ratings. In the exclusion condition, they tried to recall the behavior to exclude what-

ever bias it might create in forming impressions from the faces alone. Trait ratings were made immediately, after a 20-minute delay, or after a two-day delay. PDP estimates showed a significant effect of automatic processes on these ratings, regardless of delay. However (as expected), effects of controlled processes were significant immediately and after 20 minutes, but fell to nonsignificant after two days.

These studies demonstrate the feasibility of using the PDP to separate automatic from controlled effects of implicit impressions on trait ratings and show that both kinds of processes contribute to such ratings. It would be informative to include STT in such studies, to estimate and compare effects of automatic and controlled processes on trait ratings from STT and STI.

Payne et al. (2005; also Payne 2005) described a PDP approach to attitudes’ (stereotypes’) effects on behavior. Their results illustrate the utility of distinguishing automatic from controlled processes in responses to Black and White actors in Payne’s weapon/tool task (Payne 2001). They showed that “participants were not ‘blinded’ by race so that they could only discriminate between weapons and tools when they inhibited the race bias. Instead, the actual objects and racial bias served as separate bases for responding, with decisions based on perceptual discrimination requiring cognitive control. When that control failed, the automatic race bias had its effect” (Payne et al. 2005, p. 415). The PDP also allowed Lambert et al. (2003) to show that a counterintuitive finding—more prejudiced behavior in an anticipated public (versus private) setting—occurred because the anticipation of behaving in public decreased cognitive control.

Conrey et al. (2005) generalized this approach to cases where two automatic and two controlled processes might operate; hence, their quad model. Using multinomial modeling to analyze responses to the Implicit Association Test (IAT) and Payne’s task, they showed that the model “disentangles the influences of 4 distinct processes . . . : the

Four horsemen of automaticity: lack of awareness, lack of intention, cognitive efficiency, and lack of control

Process dissociation procedure (PDP): yields separate estimates of the effects of automatic and controlled processes on the same task

Payne’s weapon/tool task: asks participants to rapidly judge whether an object is a weapon or tool. African American primes increase mistaking tools for weapons

Amodal: lacking or stripped of features that characterize particular sensory modalities

likelihood that automatic bias is activated by a stimulus; that a correct response can be determined; that automatic bias is overcome; and that, in the absence of other information, a guessing bias drives responses” (Conrey et al. 2005, p. 469). Thus, multiple simultaneous interacting automatic and controlled processes can be modeled and their separate effects estimated.

Burke & Uleman (2006) extended this work to effects of STI on trait ratings, as in Uleman et al. (2005). Participants viewed 80 face-behavior pairs for six seconds each, followed by a distracter task. Then they rated each of the 80 faces. Statistical procedures for separately estimating individual differences in trait scale use were added to the quad model. Parameter estimates were generally as predicted. Faces automatically activated the implied trait; participants were very poor at intentionally determining the correct response (i.e., recalling the paired behavior); participants overcame the automatic activation bias whenever they could determine the correct response; guessing was low; and including participants as a random effect accounted for significant variance.

All this demonstrates the advantages of using multinomial modeling (e.g., the quad model) to decompose component processes that underlie the use of implicit impressions (including STIs and stereotypes). These methods also put the focus back on control and enable us to test models that are more sophisticated and go beyond the false dichotomy of automatic versus controlled processes. (See also social neuroscience models of automatic and controlled processes, e.g., Amodio et al. 2004, Lieberman 2007.)

Abstract, Amodal, Disembodied Cognition Versus Situated, Modal, Embodied Cognition

Cognitive science has long harbored a “disembodied” view of cognition. The computer metaphor of the mind assumes an amodal architecture, despite little supporting evidence

(Barsalou 1999). An alternative approach, usually called “embodied cognition,” takes a modal view of knowledge representation (see Barsalou 2008) in which, “[w]hen a category is represented conceptually, the neural systems that processed it during perception and action become active” (Barsalou 2003, p. 523). This is not to say that perceptual and conceptual systems are isomorphic, but rather that they are nonmodular and employ common structures and processes.

Although social psychological conceptualizations of cognition are still primarily amodal, the field is replete with demonstrations of embodiment in both knowledge acquisition and knowledge use; see Niedenthal et al. 2005 for a review. Smith & Semin (2004), guided by their “situated social cognition” framework, integrate many of these demonstrations. For instance, the principle that “cognition is for action” implies that person “impressions are action-oriented representations”; that is, that “relational interdependence and its action implications are integral to the way we represent people” (Smith & Semin 2004, p. 64).

Mimicry as evidence of online embodied implicit impressions. Nonconscious behavioral mimicry provides evidence of implicit impressions that are clearly situated and embodied. A wide range of actions, such as facial expressions, body postures and gestures, speech patterns, and emotional states of others, are mimicked by perceivers without awareness (see Chartrand et al. 2005 for a review). This is a critical social skill whose impairment is related to difficulty in inferring others’ mental states, such as emotions (McIntosh et al. 2006).

Nonconscious mimicry also suggests a direct yet flexible perception-behavior link (Dijksterhuis et al. 2007). Factors that facilitate (versus inhibit) how much a perceiver mimics a target person include induced positive (versus negative) mood (van Baaren et al. 2006), dispositional empathic ability (Sonnby-Borgström et al. 2003),

and heightened affiliation needs (Lakin & Chartrand 2003). Thus, mimicry provides an unconscious means of accomplishing social goals (see also Chartrand & Dalton 2007).

Associative Versus Rule-Based Processes

Smith & DeCoster (2000) argued for the existence of two processing modes that function simultaneously. Associative processing depends on “associations that are structured by similarity and contiguity and are learned over many experiences. [It] occurs automatically and preconsciously, with awareness of the result of processing.” Rule-based processing depends on “symbolically represented rules that are structured by language and logic and can be learned in just one or a few experiences. [It] occurs optionally when capacity and motivation are present and often with conscious awareness of steps of processing” (Smith & DeCoster 2000, p. 111). They used this dichotomy to integrate and extend many other domain-specific dual-process models in social psychology. Whereas earlier models of person perception and attribution tended to posit sequential steps or mutually exclusive modes of information processing, Smith & DeCoster (2000) suggest these modes function simultaneously (see also Lieberman et al. 2002). For example, reactions to stigmatized persons online demonstrate that each mode has its own time course and that they “interact dynamically over time to produce not only subjective states in the perceiver . . . but also overt behavior” (Pryor et al. 2004, p. 438). Smith & DeCoster (2000) note that “associative memory systems can perform attributional reasoning . . . and can combine multiple knowledge structures” (p. 128), contrary to the common assumption that such systems are unsophisticated and that attributions must rely on rule-based processes.

Useful as this distinction is, it does not capture all the differences between STI and STT described above. STT “associations” occur on a single trial, rather than being grad-

ually established. Would multiple STT trials strengthen their effects, perhaps to the level of STI effects? Is STI best characterized as associative or rule-based? Neither STI nor STT results from the conscious deliberation that is often identified with rule-based learning.

According to Gawronski & Bodenhausen’s (2006) dual-process model, attitudes result from two kinds of processes and their interplay. Implicit attitudes are grounded in associative processes, whereas explicit attitudes are grounded in syllogistic propositional reasoning. Automatic reactions are jointly determined by relatively stable associations available in memory and the differential pattern of such associations that particular input stimuli (and the general context and one’s emotional-motivational states) trigger. Perceivers may view these automatic reactions as valid or invalid input for an evaluative judgment, depending on whether they are consistent with other propositions, e.g., beliefs about whether negatively evaluating a minority person is acceptable. Thus, propositional processes are concerned with consistency among and validity of evaluative reactions. Gawronski & Bodenhausen (2006) present a systematic analysis of factors responsible for changes in implicit and explicit attitudes, and cases that exemplify different patterns of implicit-explicit attitude change. The framework has broad applicability and can predict relations between implicit and explicit attitudes as well as the reason for and the direction of these relations (see also Fazio & Olson 2003).

In a clear demonstration that supports both conceptions of these two systems, Rydell and colleagues (2006) showed that perceivers’ implicit impressions of a target person can be determined by subliminal primes paired with this person, whereas explicit impressions are determined by supraliminally presented behavioral descriptions of the person (see also DeCoster et al. 2006). When these two types of information are of opposite valence, so are the resulting implicit and explicit impressions. Furthermore, when perceivers are exposed to new information that contradicts the

Theory of mind:

the theory each of us has about how the mind (our own and other people's) works, particularly regarding relations among mental states and behavior

Pragmatics: the rules and situational conditions that enable communication through language, but that are not described by syntax or semantics

valence of each type of earlier information, their implicit and explicit impressions change in opposite directions, reversing the direction of the initial dissociation. These impressions also affect behavior toward target persons differentially. For instance, one's preferred seating distance while interacting with another is related to implicit but not explicit impressions (Rydell & McConnell 2006).

ADULT FOLK THEORIES

Traditional attribution theory says little about the actual causes of others' behaviors (other than their locations in actors or situations) and the relationships of these causes to each other. But recent developments in philosophy and theory of mind are filling this gap and influencing empirical work in social psychology.

Malle's Model of the Folk Theory of Mind

Malle's (2004) model of the folk theory of mind is the most well developed in the literature, both conceptually and empirically. It identifies the significance of many basic concepts (intentionality, causes, and reasons) and their relationships; yields hypotheses about how and when they are used in explanations; and considers how language and the pragmatics of communication affect their expression. It is based on extensive evidence from experiments and content analyses of naturally occurring intentional explanations. The fundamental distinction is between intentional and unintentional behaviors rather than dispositional and situational causes. Only unintentional behaviors have causes. Intentional actions are explained in terms of reasons (mental states such as beliefs, desires, and valuings), or a causal history of reasons that provides the background but not the immediate reason(s), or enabling factors that make successful actions possible.

Traits, which occur in only 5% to 10% of all explanations, play multiple roles. They can

be explanations of unintentional behaviors (i.e., causes), what enables intended actions (e.g., abilities), or the history behind current reasons (e.g., chronic behaviors). It is beyond the scope of this review to summarize Malle's theory any further, but it generates many interesting hypotheses about the conditions that affect intentional explanations.

Adopting a theoretical framework that replaces the traditional situation-disposition dichotomy naturally prompts a reexamination of classic phenomena that were framed in these terms. In a meta-analysis of 173 studies, Malle (2006) reexamined the hypothesis that actors explain their own behaviors in situational terms and others' behaviors in personal or trait terms. He showed that the "actor-observer hypothesis appears to be a widely held yet false belief" (p. 907). The effect of perspective was virtually zero overall, but two interesting moderators were discovered. One was intimacy with the target, although the effect was the reverse of that classically predicted. The other was valence, with the classic asymmetry holding for negative events but reversing for positive ones. Calling the actor-observer asymmetry into question also challenges some explanations of the fundamental attribution error.

Degrees of Personhood

Adults do not always ascribe the full range of qualities of the human mind to other people, especially to outgroup members. Haslam (2006) proposed that there are two ways of dehumanizing others: "denying uniquely human attributes . . . represents them as animal-like, and denying human nature . . . represents them as objects or automata" (p. 253). His research suggests that the latter plays a large role in differentiating self from others at the interpersonal level.

Leyens et al. (2000) and Demoulin et al. (2004b) complement this work by showing that lay theories about essentialized social groups, and the degree of humanity ascribed to them, shape understandings of group

members' emotions. Leyens et al. (2000) distinguish between primary emotions (simpler, physiological, and externally caused) and secondary emotions or sentiments (complex, cognitively oriented, and internally caused) that are more closely linked to human (versus animal) concepts and rated as more "uniquely human" (Demoulin et al. 2004a). Ingroups are accorded more uniquely human characteristics, i.e., sentiments, than are outgroups, and people are reluctant to attribute sentiments to outgroups (Cortes et al. 2005, Leyens et al. 2001). Sentiments are more strongly associated with ingroups on the IAT (Paladino et al. 2002) and suggest ingroup members' humanity more strongly than do sentiments in outgroup members (Vaes et al. 2006). More cognitive resources are required to process associations between sentiments and outgroups than ingroups (Gaunt et al. 2002), though primary emotions show no such bias (Gaunt et al. 2002, Paladino et al. 2002, Vaes et al. 2006).

Thus boundaries between social groups affect our understanding of social emotions and diminish the personhood ascribed to outgroup members. Recent functional magnetic resonance imaging research supports this. Harris & Fiske (2006) showed that viewing people from some social categories, while thinking about the emotions they evoke, does not activate brain regions typically activated by viewing others (the medial prefrontal cortex). Sampling from Fiske et al.'s (2002) two-dimensional stereotype content model, they found medial prefrontal cortex activation to people from each quadrant except those low in both competence and warmth, i.e., the homeless and drug addicts. Importantly, adopting a more individuating goal (judging their food preferences) eliminated this effect (Harris & Fiske 2007).

Continuous rather than categorical variables also moderate how much others are viewed as having complex mental lives. The longer a target is known, the more cognitive-affective units (e.g., feelings, thoughts, goals, beliefs, expectancies, plans, and needs) and

the fewer traits used in describing him/her, as long as the target is positive or important (Idson & Mischel 2001). More IF-THEN observations, more explanations of these observations, and a higher proportion of cognitive-affective units are used to describe significant others (Chen 2003). When we evaluate others more positively, we make stronger mental state attributions to them and identify their actions at higher levels (e.g., as "expressing disappointment" versus "frowning"), especially when their actions are also positive (Kozak et al. 2006). When others are psychologically distant, perceivers give more weight to global dispositions (Nussbaum et al. 2003). Physical distance from actors even increases STIs (Rim et al. 2007).

Overall, when others are less positively valued, less important, less familiar, more distant, and/or outgroup members, they are accorded a simpler mental life and fewer conditional responses to life's exigencies.

Simulation or Social Projection

Much research on "the problem of other minds" (i.e., inferring other's mental states) emphasizes the self (see Alicke et al. 2005, Malle & Hodges 2005). Notwithstanding positive illusions about the self, researchers generally agree that people automatically use self-knowledge to make inferences about others, assuming self-other similarity by default (Epley et al. 2004b, Krueger 2003, Mussweiler 2003, Nickerson 1999), especially for ingroup members (Robbins & Krueger 2005). For instance, people spontaneously project their chronic and primed goals onto others (Kawada et al. 2004). People assimilate impressions of their partners to themselves, an adaptive process in high-functioning romantic relationships (Murray et al. 2002).

Children only start correcting these automatic egocentric inferences with sufficient practice (Epley et al. 2004a). Perspective taking seems to fit an "anchoring-and-adjustment" conceptualization. Egocentric biases increase under time pressure, decrease

Simulation theory:

posits that we understand others by imagining ourselves in their place, and we use that to simulate their experience

with accuracy motivation, and are adjusted serially and insufficiently, stopping at a satisfactory but not necessarily accurate point (Epley et al. 2004b). Although taking the self as a basis for social inference is a reasonable, even adaptive, strategy in the absence of other information (Krueger & Acevedo 2005), adults act egocentrically even when they have ready access to concrete knowledge of others' beliefs (Keysar et al. 2003).

According to Van Boven & Loewenstein's (2003) dual-judgment model, people first imagine being in the other's situation. Indeed, simply imagining another's feelings in another situation activates several self-related cognitions (Davis et al. 2004). Because people typically show an "empathy gap" in self-predictions (i.e., self-predictions are colored by current mental states), this gap also opens in predicting others. Thus, thirsty perceivers projected more thirst onto others in a different situation (mountain hikers led astray), and this was mediated by self-predictions for that situation (Van Boven & Loewenstein 2003).

Judging self versus others sometimes relies on different information (introspection versus lay theories, respectively), producing divergent inferences about self's and others' intrapersonal and interpersonal insight (Pronin et al. 2001). Self and others are also perceived as different in essential humanness (Haslam et al. 2005), being driven by ulterior motives or self-interest (Reeder et al. 2005), and being susceptible to influence and bias (Ehrlinger et al. 2005, Van Boven et al. 2003) (see Pronin et al. 2004 for a review). Perceivers project more when the targets are similar to themselves, even in unrelated domains, but they rely on stereotypes when others are dissimilar (Ames 2004).

Threatened self-esteem leads to "egocentric contrast" in perceiving others (Beauregard & Dunning 1998). More broadly, ego threat may lead people to defensively project threatening self-views, particularly when stereotypes are consistent with such derogation (Govorun et al. 2006). Traits

one abhors in oneself may be projected onto others (Mikulincer & Horesh 1999, Newman et al. 1997, Schimmel et al. 2003). Hence, the influence of self on social judgment involves not only the actual self, but also possible selves (McElwee & Dunning 2006). Generally, perceivers are motivated to see others in ways that harmonize with current self-views, or better yet, enhance self-views (Dunning 2003).

By contrast, Karniol (2003) proposed that unique self information carries a "distinctiveness tag" in memory. When relevant information is not tagged, then "generic representations of prototypic situations and prototypic others serve as the default and are used to generate answers about the self" (Karniol 2003, p. 571). In this protocentric view, nonself exemplars play a larger role than does the self in judging unfamiliar others. Thus, judging unfamiliar others facilitates judging familiar others more than it facilitates judging the self, suggesting spontaneous recruitment of familiar others for the initial judgment (Karylowski et al. 2000). The self plays an even smaller role in judging others when task demands highlight its uniqueness or when judging observable (versus unobservable) manifestations of traits (Karylowski & Ranieri 2006). In response, Mussweiler (2003) noted that self-knowledge can still drive inferences about others who differ from the self and suggested that social prediction is still broadly egocentric.

In short, people are plagued by egocentric biases in perceiving others because of cognitive (e.g., high accessibility of the self) and motivational (e.g., self-enhancement) factors. Overall, mental state inferences have moved from a "haphazard enterprise" (Davis 2005, p. 53) to a systematic study of tools available to perceivers, when they are used, how they are used, and with what results. These issues are part of a heated debate between simulation theory versus theory-of-mind accounts of mind reading (Karniol 2003, Saxe 2005). Although these accounts assume universal cognitive skills, other researchers have focused on cultural differences.

Cultural, Subcultural, and Social Class Differences

Westerners (largely from the United States and Canada) emphasize personal causes of social behavior, whereas Asians emphasize situational or social structural factors (Fiske et al. 1998, Lehman et al. 2004, Nisbett 2003, Nisbett et al. 2001). Although Nisbett et al. (2001) emphasized differential weight given to situational information, cultural differences in STI occur when situational information is virtually absent. Zárate et al. (2001) used lexical decision response times to detect STI from single sentences. They found STI among Anglo but not among Latino students at the same U.S. university.

For Westerners, drawing trait inferences from behaviors is more likely than drawing behavior inferences from traits (Maass et al. 2001, 2006a). This “induction-deduction asymmetry” is reduced or even reversed among East Asians (Maass et al. 2006b). Knowles et al. (2001) suggested that situational correction varies cross-culturally. They found that Westerners made more extreme dispositional inferences from trait-diagnostic behaviors despite situational constraints, particularly under high cognitive load. Easterners may have more practice-induced facility with situational correction. Precisely where cultural differences have their effects within multistage conceptions of trait and situation inferences is unclear.

Differences in language use reflect, and likely contribute to, these cultural differences. Westerners use more trait adjectives than do Easterners, who use more behavioral verbs that incorporate contextual information to describe others and to remember and organize information about them (Maass et al. 2006b). Similarly, Westerners describe others in more abstract, decontextualized terms, whereas Easterners use more specific, contextual language (Kashima et al. 2006).

Lay beliefs may be influential in these findings. Easterners endorse situationist theories more than Westerners do, although there are

no differences for dispositionist and interactionist theories (Norenzayan et al. 2002). Menon et al. (1999) argued that Easterners implicitly believe the social world (groups and collectives) is more invariant than Westerners do, whereas Westerners believe individuals are more invariant. Thus, Easterners make fewer trait attributions to individuals and more to groups. Church et al. (2003) examined lay theories of behavior across cultures. Ten components fell along two dimensions, implicit trait beliefs and implicit context beliefs. These were only modestly related and independently contributed to expectations of others’ cross-situational consistency and the malleability of personality (see Church et al. 2005).

Intracultural and intranational variations also bear examination. Lillard (1998, Lillard & Skibbe 2005) notes that within both individualist and collectivist cultures, rural backgrounds foster contextual thinking whereas urban backgrounds foster more object-oriented dispositional thinking. Furthermore, in a nationally representative sample of U.S. ethnic and cultural groups, education level—more strongly than ethnic background—predicted rejection of dispositionist and situationist lay theories and acceptance of interactionist lay theories (Bauman & Skitka 2006).

Interestingly, beliefs about the trait- versus context-driven nature of human behavior (Church et al. 2003, 2005), or dispositionist, situationist, and interactionist thinking (e.g., Bauman & Skitka 2006, Norenzayan et al. 2002), are not negatively associated. Lay conceptions of causes of behaviors do not view dispositions and situations as mutually exclusive. Perhaps as Malle’s (2004) model suggests, less global causal categories and more complex causal relations should be examined.

Other Implicit Theories

There is much promising research on other implicit theories, including Fiske et al.’s

Entity theories: beliefs that human attributes are fixed and unchangeable

Incremental theories: beliefs that human attributes are malleable

(2002) stereotype content model that predicts affective responses to social groups. Ybarra (2002) presents considerable support for a lay theory of valenced behavior, in which positive behaviors are caused by situations and negative behaviors by dispositions. This “misanthropic bias” is only overridden under special conditions. Metaphor-based theories (e.g., light = good, Meier et al. 2004; up = good/down = bad, Meier & Robinson 2004; close = good/far = bad, Neumann & Strack 2000) may also spontaneously affect person perception.

Work by Dweck and her colleagues on implicit entity theories versus incremental theories continues to yield rich rewards. Molden et al. (2006) showed that under cognitive load, entity and incremental theorists selectively process information about others’ behaviors that is consistent with their theories. Plaks et al. (2005) showed that theory-violating information is avoided under high load but scrutinized more under no load. It also produced more anxiety, which increased efforts to restore feelings of control on an unrelated task. McConnell (2001) showed that entity theorists’ impressions are formed online, whereas incremental theorists’ impressions are memory based.

Research on assimilation and contrast in person perception is another area where implicit theories (or mere mechanisms) are central. Space limitations preclude a review here, but two excellent sources are available: Biernat (2005) and Stapel & Suls (2007).

IMPLICIT CAUSAL THEORIES

Bayesian Networks

Attributions are traditionally understood in social psychology as being about causes, e.g., traits and attitudes. This is explicit when people answer questions about causality. But when inferences are spontaneous, what evidence is there that these concepts describe causes rather than semantic associates or summary characterizations? Sometimes their

causal status is clear from content and context (Hassin et al. 2002); more often, it is not (Carlston & Skowronski 2005). Recent developments in Bayesian networks (see Sloman 2005 for a nonmathematical introduction) provide new ways to approach these questions because they model probabilistic causal theories—including discounting, mental simulation, and counterfactual reasoning—more precisely than is possible with the verbal formulations traditionally used in social psychology. They essentially consist of directed graphs in which nodes (features or events) are linked by conditional probabilities, and a set of formalisms for calculating normative revisions in the network of beliefs following new information (Pearl 2000).

Bayesian nets underlie Gopnik et al.’s (2004) theory of how children acquire causal knowledge. Adults already have many causal theories and concepts based on them. Bayesian nets model how one should revise predictions following new observations versus interventions (Waldmann & Hagmayer 2005), use theory-based categories to predict unobserved features, and categorize exemplars from their observed features. They can also be used to discover what theories were used to perform such tasks.

For example, Rehder & Burnett (2005) used Bayesian nets to examine how people use newly learned categories in which category features are causally related. After participants learned the categories to criterion, they inferred unobserved features of new category members and categorized new exemplars described only by their features. Causal relations among features strongly affected performance on both of these tasks. More interestingly, participants’ inferences violated the “causal Markov condition” of Bayesian nets, which holds that whenever causes are changed directly by interventions from outside the network, their consequences (descendants) are isolated from any effects of their antecedents (ancestors). Instead, participants seem to use these now causally irrelevant features to judge how much exemplars were well-functioning

category members. And participants elaborated on the causal structure they were taught, inferring additional implicit causes and using these revised models to make judgments. Apparently, “people assume that categories possess a single underlying mechanism that varies in how well it functions, producing as a result either many or few characteristic features” (Rehder & Burnett 2005, p. 300). This “underlying mechanism” effect did not depend on domain specific knowledge, as it occurred for animate, economic, weather, and social systems. Would novel social categories (e.g., person types) exhibit this effect? Might this effect contribute to stereotype formation?

Perhaps traits are person categories based on causal theories that link mental states, situations, and behaviors. Could people use such categories rapidly (as suggested by STI research) in ways that reflect their causal structure? Luhmann et al. (2006) taught participants four novel categories based on causally related features and tested whether this knowledge was used in categorizing new exemplars under speeded conditions. It was, even when participants had as little as 500 ms to view the exemplar and 300 ms to respond.

The conceptual possibilities and computational tractability of Bayesian nets for modeling complex causal beliefs have not been exploited in social psychology. But they have great promise and power for extending our understanding of complex causal thinking, the use of theory-based categories in category and feature inferences, and the implicit inferences underlying causal mechanisms.

Causal Relations in Recent Attribution Research

The induction-deduction asymmetry (Maass et al. 2001) was shown when participants listened to descriptions of others in terms of traits and behaviors, matched for diagnosticity and memorability. Recognition errors and response times showed behavior-to-trait inferences were more likely and occurred online, whereas trait-to-behavior inferences were less

likely and were memory based. Because “traits serve more as potential prior causal aspects of behaviors” (Maass et al. 2001, p. 401) than vice versa, inferring trait causes is more likely than behavioral effects. Maass et al. (2006a) used free recall to show that the same asymmetry occurs under other processing goals. Adjectives (traits) were falsely recalled more often than verbs (behaviors), but tellingly, only when the agent was a person (versus the weather).

Discounting falls naturally out of Bayesian common effect networks. But as McClure’s (1998) insightful review makes clear, discounting is neither as ubiquitous nor as simple as social psychology texts suggest, and several processes are implicated. Discounting is less likely when several causes are seen as joint contributors to the outcome (such as goals and preconditions). Sufficient causes discount others, whereas necessary causes are not discounted. Logical relations among causes and effects account for many discounting findings without resorting to cognitive bias or heuristics. But the anchor-and-adjust heuristic may underlie McClure’s (1998) finding that, when causes are presented sequentially, the first cause is less likely to be discounted by subsequent causes than when they are presented simultaneously. Explanations (communicated causes) can differ from perceived causes. When rating causes, the “status of causal candidates can be clarified by distinguishing . . . probability, necessity, sufficiency, and explanatory value” (McClure 1998, p. 16).

Extending this analysis, Roese & Morris (1999) showed that discounting versus conjunction effects, respectively, depend on causes (*a*) co-occurring or being mutually exclusive, (*b*) sharing a common causal mechanism or not, and (*c*) sharing the same valence or not. “People are more likely to discount an explanation . . . that differs in valence from that implied by the initial explanation, and . . . prefer conjunctions of two explanations if they imply the same impression valence” (Roese & Morris 1999, p. 446). Oppenheimer (2004) showed that

Common effect networks: causal networks with multiple causes that all contribute to the same effect. Differs from common cause networks, in which multiple effects are produced by the same cause

CB: correspondence bias

FAE: fundamental attribution error

people “spontaneously discount . . . availability in frequency judgments [of surnames or letters] when conspicuous alternative explanations [famous surnames or own initials] are available” (p. 104) but not made explicitly relevant. This suggests that people “make causal attribution to explain their own cognitive states, and do so spontaneously.”

The Correspondence Bias and the Fundamental Attribution Error

Correspondence bias (CB) and the fundamental attribution error (FAE) are two phenomena that are often explained as failures to discount dispositional causes sufficiently in light of situational constraints and treated as synonymous. But Gawronski (2004, p. 209), as well as others, distinguishes between the CB (“to draw correspondent dispositional inferences from situationally constrained behavior”) and the FAE (“the tendency to underestimate situational influences on human behavior”). Two recent reviews challenge the generality of each. As does McClure (1998), both reviewers reject the common hydraulic assumption that dispositional and situational causes always occur in a common effects causal model. Gawronski (2004) focuses on implicit theories of situational influences. He argues that people do have theories of situational causes and do believe that situations affect behavior. But they may fail to apply these theories (e.g., if the situation is not salient enough), or deliberately neglect situational causes (e.g., if they believe immoral behavior is highly diagnostic of immorality, regardless of the situation), or emphasize situational causes to interpret ambiguous behavior, thereby making stronger dispositional inferences. Even under concurrent cognitive load, people can characterize situational pressures if that is their goal (Krull 2001).

Sabini et al. (2001), like Malle (2004), believed the internal-external cause dichotomy is incoherent. They argued that research has “not shown that dispositions in general are significantly less important than laypeople be-

lieve them to be” (p. 1). Instead, “Americans (at least) think that they should . . . treat as unimportant certain motives that are in fact not at all trivial . . . to save face (for oneself and others) and to avoid embarrassment” (p. 2). Most of these studies entailed face-threatening (ego-dystonic) acts. But participants deny this and find other explanations, thereby saving face and exaggerating the importance of correspondent dispositions. Direct tests of this viewpoint would be welcome.

Reeder et al. (2004) also note the shortcomings of the internal-external dichotomy. Their multiple-inference model fits participants’ ratings, open-ended explanations, and RT data better than either global situation/disposition inferences or Fein’s (1996) work on suspecting ulterior motives. The multiple-inference model emphasizes that people make multiple inferences about motives in trying to understand voluntary behavior, integrate situational information into these motives, and base trait inferences on them. This theory is consistent with a substantial body of research, including Kammrath et al. (2005).

Nevertheless, leading researchers continue to frame findings in terms of the internal-external or disposition-situation dichotomy. Van Boven et al. (2003) showed that when making dispositional inferences, North Americans expect their peers to correct less for situational pressures than they themselves do. Yzerbyt et al. (2001) showed that correcting dispositional inferences for situational pressures involves suppressing the dispositions, which produces dispositional rebound when rating subsequent targets. But these results could be easily reframed in terms of specific mental states and situational causes. Such reframing may also be more accurate, as in Van Boven et al.’s (2003) Study 1, where the data violate a hydraulic relation between situational and dispositional causes. It is time to move beyond the CB and FAE as misleading overgeneralizations, and to focus instead on mapping people’s specific theories (implicit and explicit) of the causal

interrelations among mental states, situations, and behaviors.

DEVELOPMENTAL ANTECEDENTS

Developmental research is instructive because it draws on different theoretical and methodological traditions, yet deals with many of the same issues noted above.

Infants

Recent infant research shows that (a) to infants, other people are objects of special interest and attention from birth; (b) 1-year-old infants infer dispositions and future behaviors of others in relatively mature ways; (c) these inferences are necessarily implicit; (d) they usually occur in intensely reciprocal social interaction; and (e) language development adds new layers of complexity to these inferences (see also Saxe et al. 2004). Murphy (2002, chapters 9 and 10) reviews development of infants' basic conceptual processes, but without a focus on social concepts and interaction.

Cassia et al. (2001) showed that newborns preferentially track face-like high-contrast displays, relative to non-face-like displays matched on properties such as visual complexity. Within four days, infants are biased toward their mothers' faces (Bushnell 2001). Preferential attention to human speech occurs before birth (DeCasper et al. 1994), and newborns show many language discrimination skills (Ramus 2002).

Evidence for a fundamental person perception distinction—between animate and inanimate behavior—appears as early as six months. Much of this evidence shows that infants react differently to animate agents (those that demonstrate directed and internally caused movement, contingent behaviors, change after proximal contact, and goal-relevant and intentional acts) than to those without these attributes. Sensitivity to features of animacy emerges at different ages rather than all at once (see Rakison & Poulin-

Dubois 2001). Infants can also distinguish between intentional and accidental acts, a skill that requires mental state attributions that are more sophisticated. For instance, 16-month-olds are less likely to repeat an adult's action that is followed by "Whoops" (and hence accidental) than by "There!" (Carpenter et al. 1998). The distinction serves as an organizing principle for many theory-based categories (e.g., Gelman 2004) and is both fundamental and complex.

Person perception differs from object perception because, as people ourselves, we can use self-knowledge as a basis for knowing others (see Simulation Models, above). This requires distinguishing ourselves from others as well as mapping between others and ourselves. Newborns show immediate imitation of others (Meltzoff & Moore 1989), and by six weeks, they show delayed imitation, perhaps as a way of eliciting responses that identify others (Meltzoff & Moore 1994). Coordinated reciprocal interaction emerges by four to six months (Rochat et al. 1999). Moore (2006) notes that this gives infants a wide range of coordinated experiences from both a first- and a third-person perspective. Such social interactions teach how both self and others experience the world in similar and different ways (Barresi & Moore 1996).

In short, infants' "understanding" of others is based on distinguishing animate from inanimate motion, intentional acts from unintentional ones, and own actions from others' actions. This occurs largely without language production (although some language comprehension accompanies later developments). These complex achievements represent ways to understand others implicitly, i.e., without explicit reference to prior episodes.

However, most research on adults has focused on trait inferences. Can infants infer dispositions? Kuhlmeier et al. (2003) and Hamlin et al. (2007) addressed this question by having younger (5- to 6-month-old) and older (10- to 12-month-old) infants watch displays in which a ball was "helped" by a triangle and "hindered" by a square when climbing

a hill, and then seemed to affiliate with one of the shapes. Older (but not younger) infants looked longer when the ball affiliated with the helper rather than the hinderer in a new context. The researchers interpreted this to mean that older infants attribute dispositional goals to an agent (the ball), as well as make the distinction between friend and foe. These carried over to the new context, producing expectations about the agent's behavior. Hamlin et al. (2007) also prompted infants to choose between the triangle and the square, and showed that infants of all ages preferred the helper. That is, choice preferences for "nice" rather than "mean" agents emerged at a younger age than attributions of goal dispositions to the ball.

Note that in these studies, dispositions are defined in several ways: in terms of goals, typical behaviors, and moral character; and that, as in Hamlin et al. (2007), different measures (looking times, preferences) show that different inferences are drawn from the same scenarios at different ages. Thus, evidence for dispositional inferences depends on the dependent variable employed and the response system(s) it engages. Second, the meanings of dispositions (e.g., merely valenced or related to behavioral intentions) change with age and experience, even among preverbal infants. This echoes Yuill's (1997) suggestion that understanding the development of trait inference and use may require classifying traits in terms of the mental states they involve. Attributions of different kinds of traits are likely to have different developmental histories, require different kinds of evidence (e.g., Rothbart & Park 1986), and refer to different mental states. There is recent evidence that infants measure up to the gold standard for inferring mental states, in that 15-month-olds can attribute false beliefs to others and hence "already possess (at least in a rudimentary and implicit form) a representational theory of mind" (Onishi & Baillargeon 2005, p. 257).

The development of language provides new layers of inferential, representational, and meta-representational possibilities. Baird &

Astington (2005) view language as causal in toddlers' growing ability to distinguish intentions from goals. Mastering standard theory-of-mind tasks is correlated with the child's use of relative clauses (Smith et al. 2003) and is caused by mothers' use of mental state language with their children during the preceding year (Ruffman et al. 2002).

Toddlers

Toddlers' understanding of personality traits is demonstrated most often by predicting others' behavior in new contexts. But many strategies can be used to predict future behavior. Alvarez et al. (2001) presented brief stories implying generosity or selfishness, neatness or messiness, bravery or fearfulness, etc. Kindergartners and fourth graders then predicted relevant behaviors in new situations, and finally gave trait and evaluative ratings. Even though both groups of children made the same explicit trait and evaluative inferences, mediational analyses showed that kindergartners relied on global evaluations, whereas fourth graders relied on traits. Thus, even when people make the same explicit trait attributions, they can use different aspects of the trait's meaning to predict future behavior.

Children also use other types of person information besides traits, valences, and mental states to make predictions. Kalish & Shiverick (2004) showed that 5-year-olds use deontic rules (e.g., prohibitions) to predict others' behaviors and affect, whereas 8-year-olds use others' preferences. Diesendruck & haLevi (2006) showed that 5-year-olds rely more heavily than adults do on social category memberships, and less on personality traits, when inferring mental states. Generally, younger children use traits less than older children or adults (Yuill 1997).

Trait labels can affect toddlers' inferences about mental states. Heyman & Gelman (1999) found that preschoolers' inferences about story characters' mental states were influenced by whether they were labeled "nice" or "mean" and "shy" or "not shy" (see also

Giles & Heyman 2005). Preschoolers even used novel trait labels more than physical appearance to predict novel (trait-unrelated) preferences (Heyman & Gelman 2000). Thus, “preschoolers appear to have some understanding that trait labels have implications for the mental lives of others” (p. 15). It remains to be seen whether toddlers understand such traits as simple person categories or in dimensional terms.

In sum, there is a growing array of methods for detecting children’s implicit inferences

that do not depend on verbal reports. These often depend on inferences having multiple consequences, and show that children of different ages use the “same” inference in different ways. There is ample evidence of implicit inferences about other people, including valence, animacy, agency, beliefs, goals, intentions, and traits. Note that the initial building blocks of person perception in infants are primarily perceptuomotor, multimodal, and procedural, and emerge largely from highly motivated social interaction.

SUMMARY POINTS

1. Implicit social inferences are ubiquitous, and spontaneous trait inferences are but one example.
2. Implicit social inferences are studied by varying processing goals, verbal information, visual (especially facial) information (static and dynamic), and social and cultural contexts. They affect online response times, memory, affect, judgments, and incidental and goal-directed behaviors.
3. Major theoretical processing dichotomies in social psychology capture many but not all of the phenomena they reveal. Multinomial models are useful for disentangling processes.
4. Recent models of adult folk theories and children’s theory of mind are highly relevant but poorly integrated with work on implicit impressions.
5. Bayesian networks are similarly relevant but underutilized.

FUTURE DIRECTIONS

The suggestions below are only illustrative; others are in the text. The review itself should suggest more future directions to thoughtful readers.

1. How can STI, STT, evaluative conditioning, and spontaneous meta-inferences (based on the social contexts in which people provide information about themselves and others) be theoretically integrated?
2. How might major processing dichotomies be supplemented to encompass divergent phenomena such as STI and STT that are, for example, both automatic in some senses, and also apparently rule-based and associative (respectively)?
3. Which mental states, described in folk psychologies and theory of mind, are spontaneously inferred, and when do only more abstract inferences occur?
4. How might dehumanization affect these phenomena?
5. What roles do causal theories versus other processes (mere associations) play in phenomena such as STI or the induction-deduction asymmetry?
6. What might brain activity correlates of implicit versus explicit impressions reveal?

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