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Controversies, Questions, and Prospects for Spontaneous Social Inferences

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Abstract
Three decades of research on spontaneous social inferences, particularly traits, have settled some questions and generated more. We describe that research in terms of these controversies and questions. If you think you know the story, read on because it continues to surprise all of us. It deals with such broader issues as automatic and controlled processing, the nature of meaning, causality, stages of forming inferences about others, the role of consciousness, and differences between implicit and explicit impressions. Evidence on neurological substrate is growing. Spontaneous inferences continue to be a useful tool for illuminating impression formation processes.

Controversies have impelled the history of research on spontaneous social inferences. As Gilbert (1998, p. 112) noted, the early studies of spontaneous trait inferences (STIs) were ''inventive, important, and imperfect, thus guaranteeing a slew of dissections, extensions, replications, and rejoinders.'' This article reviews the most important controversies, questions, and suggests future directions of research. We remain grateful to critics and friends (often the same people) for their interest over the past quarter century.

''Spontaneous inferences'' have been defined in several ways (e.g., Weiner, 1985). But this article focuses on those that occur ''without intentions or instructions, at the encoding stage of processing behavioral information'' (Winter & Uleman, 1984, p. 237). They are detected by methods other than self report. Developing such methods has been a major focus. Typically in this research, people attend to brief verbal descriptions of trait-implying behaviors, without any intention to form impressions or to infer traits. Their goal may be to memorize behaviors for a subsequent memory test, or to familiarize themselves with ''stimuli that will be used later in the study.'' For example, they might read, ''She solved the mystery half-way through the book,'' which implies that she is *clever*. The challenge is to find out when people make such inferences, without asking them directly.

It might seem obvious that people make implicit inferences (although not obvious how to show this). It was to Solomon Asch.

> ''We look at a person and immediately a certain impression of his character forms itself in us. … such impressions form with remarkable rapidity and great ease. … we can no more prevent its rapid growth than we can avoid perceiving a given visual object or hearing a melody.'' (Asch, 1946, p. 258)

Yet decades of research on attribution theory – which implicitly portrayed people as deliberately working out the causal implications of what they observed and remembered –

shifted the focus to explicit reasoning and self-reports of the results. Lacking methods to study unintended thought (Uleman & Bargh, 1989), we primarily looked under the lamp post where the light was bright, rather than off in the shadows where we lacked good methods.

Recent decades produced new methods that shine some light into these shadows. We can begin to see the shapes of the processes that underlie spontaneous impression formation. There is no single narrative describing these developments because they come from many labs and points of view, and because new questions continue to arise. But there is a chronology of cumulative knowledge touching on the issues noted in the abstract. This is how it happened (so far).

How can you Demonstrate *Spontaneous* (Unintended and Unconscious) Social Inferences?

Research on spontaneous social inferences began in the heyday of attribution research, in the early 1980s. Throughout the 1970s, participants reported causal attributions for virtually everything, on paper-and-pencil scales. Researchers assumed that causal attributions were ubiquitous and occurred even when no one asked for them. Eventually, some began to question the assumption of incessant causal attribution. When do people make causal attributions? One might ask participants to think aloud while they perform tasks that may involve attributions. This method yielded rich results in problem solving, concept formation, and other cognitive domains (Ericsson & Simon, 1993). Wong and Weiner (1981), seeking a less reactive procedure, asked for the questions that participants would have asked themselves *following* particular outcomes. Attributional questions occurred most often after negative and unexpected outcomes. Hastie (1984) found that unexpected events elicited more causal reasoning, and Weiner's review (1985) supported this finding.

However, evidence was accumulating that most causal reasoning takes place outside of awareness (Nisbett & Wilson, 1977; cf. Smith & Miller, 1978) and hardly qualifies as "reasoning" (Taylor & Fiske, 1978). So other methods were sought to tap unconscious thought. Smith and Miller (1983) had participants read trait-implying sentences and measured response times to various questions. Participants were quick to answer questions about the actors' gender, the intentionality of his behavior, and whether the implied trait described the actor (RTs < 2.5 s). Contrary to popular theories at the time (e.g., Orvis, Cunningham, & Kelley, 1976), people were slower to decide whether the actor's behavior was caused by something about the person or the situation (RTs > 3.4 s). Apparently trait (and gender and intention) inferences occur at encoding, during comprehension, whereas other inferences require more time.

Cued recall

Are inferences measured by response latencies to questions about actors and their behavior really "spontaneous"? Laraine Winter (Winter & Uleman, 1984) employed the principle of encoding specificity in her MA thesis to test the spontaneity of trait inferences. This principle states that "specific encoding operations performed on what is perceived determine what is stored, and what is stored determines what retrieval cues are effective in providing access to what is stored" (Tulving & Thomson, 1973, p. 369). So if people infer traits upon reading such sentences, traits should be effective retrieval cues for recalling the sentences. Preparing for "a memory test," participants read a series of 12 to 18 sentences like those used by Smith and Miller (1983). Then their memories for the sentences were cued with either the implied traits, strong semantic associates to the actors or the predicates, or no cue. As predicted, and *in spite of the absence* of pre-existing semantic associates between traits and sentence parts, trait cues were just as effective as semantic cues in aiding recall, and were more effective than no cue. Apparently the associations between sentences and implied traits were newly established at encoding. Participants were unaware of making trait inferences. So when attending to trait-implying behaviors, people *do* make trait inferences without intentions to do so or awareness.

This and similar studies were challenged in several ways. Empirically, D'Agostino and Beegle (1996) showed that the superiority of trait cues over no cues is an artifact of a within-Ss design. That is, in the original cued-recall studies, cue type was a within-Ss factor and each participant got one cue type (dispositional, semantic, or no cue) per sentence. But retrieval of some material from a list inhibits free (non-cued) recall of the rest of the list (Nickerson, 1984). This well-known counter-intuitive part-list cuing effect could account for the superiority of trait-cued over non-cued recall, within-Ss. And indeed, when D'Agostino and Beegle (1996) repeated the earlier studies with a between-Ss design (so no participant got both cued and non-cued conditions), the superiority of trait cues disappeared! JSU was so upset about this finding that he repeated D'Agostino and Beegle's study. To his surprise, it replicated! Thus no conclusions could be drawn from differences between cued and non-cued recall within-Ss. Nevertheless, the equivalence of trait- and semantic-cued recall provides some (albeit null hypothesis) evidence for STI.

However, many challenged the claim that STI occurs at encoding. And a few invented better paradigms to test this.

Do STIs Occur at *Encoding,* Rather than Retrieval?

The claim that STI occurs at encoding depends on ruling out the possibility that retrieval cues prompt a retrieval strategy that does not depend on encoded traits. Perhaps "a subject who is given the cue 'clumsy' may think of typical clumsy behaviors, such as 'bumps into people on the dance floor,' …. These *behavioral* features may then cue the recall of the stimulus behavior even if the behavior had not been encoded in trait terms at the time it was read" (Wyer & Srull, 1989, p. 146). Wyer and Srull favored this alternative because Postulate 4.3 of their theory implied that "*behaviors will typically not be spontaneously encoded in terms of trait (attribute) concepts unless more detailed processing objectives require it*" (p. 58, italics in original).

Others were skeptical too, and frequently raised this question at conferences. Carlston (a student of Wyer's) and Skowronski (a student of Carlston's), preferring the retrieval account, came up with a clever way to test this. Participants read trait-implying sentences paired with photos and then, after a distracter task, learned photo-trait pairs. They reasoned that if traits were really inferred about the actors (photos) at encoding, then the photo-trait pairs that reinstated the initial exposures would be learned faster than novel pairs, showing "savings in relearning" (Carlston & Skowronski, 1994). Without trait inferences at encoding, there could be no savings in relearning. To their surprise, they found savings.

Today, several other paradigms provide good evidence that STI occurs at encoding. These include lexical decision (Zárate, Uleman, & Voils, 2001), probe recognition (Uleman, Hon, Roman, & Moskowitz, 1996), and false recognition (Todorov & Uleman, 2002) paradigms. None of these involve cued recall or are open to alternative retrieval explanations. And the last two paradigms have the advantage that forming STIs interferes with optimal task performance, suggesting that STI is hard to inhibit.

Are STIs "Automatic"?

The evidence that STIs occur without intentions or awareness (Winter & Uleman, 1984) suggested that they might be automatic. The next study pursued this question by looking at their independence from concurrent cognitive load, as well as a more sensitive measure of awareness. Winter, Uleman, and Cunniff (1985) presented trait-implying sentences as alleged distracters from a digit memory task. They found no intention to make inferences, no effects of cognitive load, but some awareness (among women) when questioned immediately after the last sentence. Lupfer, Clark, and Hutcherson (1990) found no effects of load, but Uleman, Newman, and Winter (1992) did. And Wells, Skowronski, Crawford, Scherer, and Carlston (2011) found clear evidence that load interferes, and is related to individual differences in working memory. Thus in terms of Bargh's (1994) four criteria for automaticity – awareness, intention, efficiency, and control – with cued recall there is some evidence of awareness of making trait inferences if it is assessed immediately (but not after even brief delays); STIs are unintentional; and there is good evidence that concurrent cognitive loads at encoding can interfere with STI formation.

Uleman and Moskowitz (1994) showed that STI formation is moderated by perceivers' processing goals (e.g., analyzing sentence features rather than reading the sentences as meaningful statements). On the other hand, both probe recognition reaction time (Uleman, Newman, & Moskowitz, 1996) and false recognition (Todorov & Uleman, 2002) paradigms show STI as uncontrolled, in that forming STIs interferes with primary task performance. Thus it may not be surprising that, even though Winter et al. concluded that STI is "largely, but not entirely, automatic" (1985, p. 904), two of JSU's former colleagues concluded that "causal or dispositional attributions are not made in an automatic, uncontrollable fashion. If they were, the particular instructions given to subjects … should not have influenced whether or not a causal inference was encoded with the behavioral stimulus" (Higgins & Bargh, 1987, p. 378). Note that there are several ways to define "control" (and "automatic"), and this turns out to be critical.

So STI is automatic by some criteria, but not by others. Of course, automatic/ controlled is neither simple nor a dichotomy. Most criteria are continuous rather than dichotomous, and do not always covary; results depend on the task; and the STI process is more complex than the relatively simple ones for which automatic/ controlled concepts were developed (Shiffrin & Schneider, 1977). In fact, Lieberman (2007, pp. 276–277) summarizes findings from social cognitive neuroscience suggesting that automatic and controlled processes have different neural substrates, so both (or neither) can be at work at any given time.

PDP

Fortunately there is another model of automatic/ controlled processes that avoids these multiple criteria and defines control in a straightforward way, and as something more than the mere absence of automaticity: Jacoby's (1991) process dissociation procedure (PDP). This model asserts that "there are no process-pure tasks," i.e., no tasks are entirely automatic or entirely controlled. All social tasks involve both automatic and controlled processes, and the question is always, how much of each and under what conditions. Control is assessed by having participants perform the task under two conditions: one in which both automatic and controlled processes work in concert to produce the outcome, and the other in which they are at cross-purposes. In the latter, participants intentionally ''control'' or exclude the influence of some prior information. Participants have control to the extent that performance differs under these two conditions.

The PDP model was first applied to STI by Uleman and Blader (Uleman, Blader, & Todorov, 2005). They were interested in the *effects* of STI on subsequent trait ratings of targets, shown in photos paired with trait-implying behaviors. These ratings depend on both automatic and controlled processes, and after a two-day delay, controlled processes drop out but automatic (implicit) impressions continue to have effects. Recently McCarthy and Skowronski (2011a, Exp. 2) replicated this, using Todorov and Uleman's (2002) false recognition paradigm. They also clarified the Uleman and Moskowitz (1994) results by showing that processing goals at encoding affect automatic but not controlled processing (Exp. 1) – a conclusion that directly contradicts earlier definitions of automatic processes (e.g., Higgins & Bargh, 1987). And they showed that greater subjective confidence in responses is related to more controlled (but not automatic) processes. So STI and their subsequent effects result from both automatic and controlled processes, and each of these is affected (as one might expect) by goals at encoding and the time delay since encoding.

What are STIs About?

Are STIs about actors or merely about the behaviors? In cued-recall studies, recall of sentences was broken down by actor and predicate. Both trait and behavioral gist (verb) cues were more effective at retrieving predicates than actors. So even though trait cues were most effective at retrieving the whole sentence (Winter & Uleman, 1984; Winter et al., 1985), some wondered whether the implied traits are about actors or merely about actions (Higgins & Bargh, 1987, pp. 377–378). In ordinary discourse, what a term is ''about'' can usually be determined by how it is used. As Wittgenstein said, ''the meaning of a word is its use in the language'' (Brenner, 1999). But spontaneous inferences are never explicitly used, so how can we know what they are about? There have been two specific versions of this question so far.

Linked to what?

The first version looks at what they are linked to in memory. Although cued-recall evidence for links to actors was mixed, two subsequent paradigms provide strong evidence that they are linked to the actor. First, the savings-in-relearning paradigm (Carlston & Skowronski, 1994) assesses the savings in learning pairs of actor photos and implied traits, relative to novel actor photos and traits. The savings is specific to particular actors. Second, in the false recognition paradigm (Todorov & Uleman, 2002), participants observe a series of photos paired with behaviors (some implying and some explicitly containing traits) under memory instructions. Subsequently they see photo-trait pairs, and judge whether or not each trait was present in the sentence they previously read about the person in the photo. This paradigm looks at false recognition of implied traits paired with actor photos, relative to implied traits paired with different but familiar actor photos. So false recognition errors are specific to the *pairing* of specific actors and implied traits, relative to mismatched but familiar actors and traits. This controls for familiarity as a source of errors, and shows that STIs are linked to actors, not merely behaviors.

Memory links to actors mean that these traits can be used to describe actors even when participants cannot recall the behaviors on which STIs are based (Carlston & Skowronski, 2005; Carlston, Skowronski, & Sparks, 1995). Memory links are not restricted to actors. Skowronski, Carlston, Mae, and Crawford (1998) discovered that the trait implications of behaviors can become associated with someone who communicates an actor's behavior. This spontaneous trait transference (STT) seems to be merely associative rather than attributional (Carlston & Skowronski, 2005), and differs from STI in several interesting ways (Crawford, Skowronski, Stiff, & Scherer, 2007; see also Uleman, Saribay, & Gonzalez, 2008). But STT does not occur if a representation (photo) of the actor is also present at encoding (Crawford, Skowronski, & Stiff, 2007; Crawford, Skowronski, Stiff, & Leonards, 2008; Goren & Todorov, 2009; Todorov & Uleman, 2004).

Causality

The second version of this question about STIs' meaning concerns whether they function as *causes* of actors' behaviors or merely as *descriptions* of actors. When "The plumber slipped $50 into his wife's purse" activates *generous*, does *generous* name a trait within the plumber that caused him to act generously, or merely describe him as generous? Early researchers and their critics (Higgins & Bargh, 1987; Winter & Uleman, 1984; Winter et al., 1985) assumed that traits were causes, and that they were studying causal attributions. Hamilton (1988) raised the possibility that these concepts were not attributions at all, but merely categorizations or descriptions. Based largely on Gilbert's (Gilbert, Pelham, & Krull, 1988) model of how initially effortless trait inferences are then corrected effortfully for situational information, he argued that STIs only constitute the first stage, and that true causal attributions must include the multi-staged and ultimately effortful analyses of Gilbert's model. Gilbert (1998) seemed to endorse this view.

This view implies that the cognitive pathway that activates a concept affects its meaning. So for inferences to be causal rather than merely descriptive, they must take into account situational contexts (described by attribution theory) that moderate intentional causal inferences. An alternative view is that concepts' meanings are independent of how they arise. Perhaps two analogies will help. The independence view is analogous to the equivalence of getting $50 by getting either $10 + $20 + $20 or $25 + $25. Both yield $50, and they are equivalent. The "pathway" view is analogous to receiving $50 as a rebate from tuition already paid, versus receiving $50 as a bonus out of the blue. Even though each is worth $50, people do treat them differently, and spend more of the bonus than the rebate (Epley, Mak, & Idson, 2006). Would this analogy hold if people forgot or never knew how they acquired the $50? Is the model of intentional inferences of Gilbert et al. (1988) appropriate for spontaneous inferences?

Recent research by Kressel and Uleman (2010) supports the independence view that activation through attributional processes is not necessary for traits to function as causes. Traits are causes even in isolation. Fenker, Waldmann, and Holyoak (2005) showed that causal relations between pairs of inanimate causes and effects (e.g., sunshine – freckles), when presented with a brief delay between words, are recognized faster when causes come first rather than second. They attribute this to the fact that causes are almost always seen before effects, in this "predictive" order. If traits are causes, then pairs of traits and behaviors (e.g., shy – blush) might show the same relation recognition asymmetry. On the other hand, traits are never physically observed; and STI research suggests that people are very practiced at making diagnostic (versus predictive) inferences. Nonetheless, results show the same asymmetry for traits–behaviors as for inanimate causes–effects, favoring the predictive order.

Additional studies (Kressel, 2011) confirmed and elaborated this. One showed that the *link* in semantic memory between traits and actions is causal, not merely associative. Ever since Quillian (1967) and Collins and Loftus (1975), cognitive psychologists have recognized different kinds of links between concepts in semantic memory. Concepts may be linked hierarchically (''is a''), or causally (''causes''), or be synonyms or antonyms, or part-wholes (''is part of a''), etc. Using lexical decision times for the second word of a pair, Kressel showed faster responses when trait-behavior pairs were embedded in a list of cause-effect pairs than in a list of associated pairs. The causal relation itself was primed by the list, speeding reaction times with no mention of causality or causal relations. In addition, participants who made more STIs also showed larger relation recognition asymmetries, i.e., had stronger implicit causal theories of traits' relations to behaviors.

If traits are inherently causal, then STIs are causal whatever cognitive processes produce them. Of course these multiple processes may make a difference if people are aware of them. And once activated, traits can be used in multiple ways (Loersch & Payne, 2011; Uleman, 2005). But all these effects are likely separable and have distinct moderators.

Recently McCarthy and Skowronski (2011b) showed that STIs are used to make predictions about actors' other behaviors, even when participants cannot remember the behaviors from which the STIs were formed. This is more evidence that STIs can function as causes. Viewing traits as inherently causal suggests that *STTs* may be used to predict future behaviors. It also suggests that traits are theory-based concepts (Murphy & Medin, 1985), i.e., concepts whose definitions are based on causal theories and causal relations among particular features. This suggests new paradigms and lines of research. Controversies and questions, indeed.

Do STIs Occur in Stages?

Gilbert's (Gilbert et al., 1988) model of intentional trait inferences is probably the best known example of a stage model of social information processing. In it, behaviors are first automatically *categorized* in trait terms; then the actor is automatically *characterized* in those same terms, producing a correspondent inference; and then a situational *correction* is (or is not) effortfully applied to this characterization, as when trait attributions are discounted because of situational causes. Trope's (1986) is another important stage model. Of course, stage or serial models are not the only possibility. Parallel processes and mutual constraint satisfaction models have many advantages (e.g., Read & Miller, 1998). But stage models provide useful ways to organize dissociable processes.

The Fundamental Attribution Error

The pervasiveness of the Fundamental Attribution Error (FAE) (Ross, 1977) is easily explained in terms of Gilbert's model. The error (giving dispositional factors too much weight and ignoring situational factors when explaining behavior) occurs when motivation, available capacity, etc. are insufficient to complete the third effortful *correction* stage. Yet Krull (1993) has shown that when one wonders what the situation rather than the person is like, taking *dispositional* information into account is effortful (Krull & Erickson, 1995). Do dispositional inferences' privileged position in Gilbert's model (and the FAE) depend entirely on one's attributional question?

Recent evidence supports the uniqueness of dispositional relative to situational inferences, even when the behavioral and situational information and questions are unbiased. Brosch, Schiller, Mojdehbakhsh, Uleman, and Phelps (forthcoming) developed 32 events equally likely to be explained in terms of dispositions or situations. For example, ''Tom left the restaurant in a hurry without tipping the waitress'' (behavior) and ''Tom's baby was screaming'' (situation). Each behavior alone implied a trait (e.g., *cheap*) and each situation provided an alternative explanation (baby emergency). Participants at NYU rated the cause of each event on a bipolar scale, from situational to dispositional, while fMRI brain scans were obtained. BOLD (blood oxygen level dependent) signals showed heightened activity in the dorsomedial prefrontal cortex (DMPFC) whenever behavioral information was encoded, regardless of the final attributions. This response in the ''mentalizing'' region is consistent with automatic dispositional attributions. However, BOLD responses in the dorsolateral prefrontal cortex (DLPFC) occurred only when final attributions were situational. This area ''has been linked to top-down cognitive control, detection of appropriate behavior among competing responses and inhibition of inappropriate automatic reactions …, and is thus a potential neural substrate of the situational correction process.'' A second behavioral study found that participants showing more Stroop interference (failure to control or inhibit the dominant response) also made more dispositional attributions (i.e., failed to take the situational information into account, $r = +0.45$). These studies are unique in using multiple unbiased stimuli, affording dispositional or situational attributions equally, to suggest that incorporating situational information into intentional causal attributions requires cognitive control, but incorporating dispositional information does not. This work should be replicated in East Asian cultures, given cultural differences in attributions (e.g., Kitayama & Cohen, 2007; Mason & Morris, 2010; Na & Kitayama, 2011).

Multiple simultaneous spontaneous inferences

Are STIs just the automatic *characterization* stage of intentional attributions for behavior, as Gilbert suggested (1998, p. 113)? We think the picture is now more complex in at least three ways. First, there is evidence that spontaneous and intentional trait inferences engage different neural substrate (see next section). Second, Ham and Vonk (2003; also Todd, Molden, Ham, & Vonk, 2011) showed that people make both trait and situational inferences, simultaneously and spontaneously. Thus learning that ''Anika got 98% on the exam'' actives both *smart* and *easy*. This is consistent with Uleman and Moskowitz's (1994) cued-recall evidence that spontaneous inferences of both traits and behavioral gists occurred simultaneously, and that far from being mutually exclusive, they were positively correlated within participants. It is also analogous to evidence in text comprehension that, upon encountering homonyms (e.g., *bank*), associates of both meanings are immediately activated (e.g., *money* and *river*). Then within 1000 ms, the inapplicable meaning is actually suppressed while the meaning relevant to the current context (e.g., *going fishing*) remains active (Swinney, 1979). These findings suggest initial parallel inference processes, the results of which are subsequently edited by more top-down processes serving larger goals.

Third, evidence is accumulating that the relative *activation* of trait concepts and their subsequent *binding* to actors are separable processes that respond to different conditions and have distinct effects. That is, they are stages. These processes were described above (What Are STIs About?), particularly in discussing STI's binding and STT's associations to actors (Carlston & Skowronski, 2005), each of which is logically preceded by trait activation. But this work only weakly suggests sequential stages. Stronger evidence for a more complex stage model comes from Rim, Min, Uleman, Chartrand, and Carlston (forthcoming).

Multiple stages of STI and the FAB model

When someone anticipates affiliating with others, explicit impressions of them become more positive (e.g., Berscheid, Graziano, Monson, & Dermer, 1976). Rim et al.

(forthcoming) were interested in whether a *non-conscious* affiliation goal could produce similar effects on spontaneous impressions of others, and if so, how. In all three studies, a word-search puzzle primed some participants with an affiliation goal. Results suggested a 3-stage STI model with some parallel processes. First, priming the non-conscious goal *focus*ed subsequent processing on functional affiliation-relevant concepts: traits. This focus produced goal shielding (Dijksterhuis & Aarts, 2010) so that, in the second *activation* stage when trait concepts are inferred from behaviors, the non-conscious goal *de-activated* trait-irrelevant concepts. These results occurred even though the behaviors, traits, and other words were unrelated to affiliation, and the actors were not potential affiliation partners. So the effect of the non-conscious goal was quite general, top-down, and affected the use of the trait-implying behaviors, traits, and non-trait concepts alike. In the third *binding* stage, positive trait concepts were bound to actors more than negative traits. The positivity bias occurred in the final binding stage. The top-down effects of the non-conscious affiliation goal became progressively more restrictive over stages in shaping the final STIs.

In these studies, lexical decision RTs measured concept activation and deactivation. Funnel debriefings established that participants were unaware of STI processes and the goal prime's effects. And three important control studies and conditions were included. The first showed that non-conscious priming of an affiliation goal, by itself, did not affect the accessibility of trait and non-trait concepts. Its effect on lexical decisions depends on inferring traits from behaviors, and does not occur without the behaviors. The second study showed that priming positivity (rather than affiliation) had no effect on binding. So this is about goals' effects on the stages in forming STI, not a more general positivity priming phenomena. The third study looked at effects of satisfying the primed affiliation goal. Participants were primed with non-conscious affiliation or not and then they had either an affiliation-satisfying or –unsatisfying interaction with others. If affiliation were operating as a non-conscious goal, rather than merely an activated semantic concept, satisfying it should discontinue its effects. And it did.

Goals (conscious or otherwise) are not the only things that can affect subsequent STI processes. Working in the framework of construal level theory (CLT; Trope & Liberman, 2010), Rim, Uleman, and Trope (2009) found that perceivers' distance from others, and general level of abstraction affected STIs. CLT holds that more distant objects and events will be construed more abstractly, in terms of features that are relatively stable across contexts. Traits are such abstractions from behaviors. Rim et al. (2009) presented STI stimuli (the usual photo-behavior pairs) as either distant or close, spatially (''They are at NYU's campus in Florence, Italy''/ ''Manhattan'') or temporally (''They were students at NYU in 1997''/ ''2007''). STIs were more likely when the stimuli were distant, as predicted. In a third study, participants first performed a task that gave them either an abstract or a concrete mind-set. Then they formed STIs. As predicted, the more abstract mind-set produced more STIs.

All these studies show that some kind of initial mind-set, like the non-conscious affiliation goal, interacts with STI processes to affect outcomes. Each mind-set serves to *focus* processing into a more limited domain, either by tilting processing toward the abstract or the concrete, or by goal shielding through de-activating goal irrelevant concepts. The result is a 3-stage model of STI: Focus, Activate, and Bind (FAB). Rim et al. (2009, forthcoming) argue that the initial focus also makes STIs functional, e.g., with respect to goals or to other contextual constraints such as distance. Thus one might think of the initial Focus as also setting STIs' Function. Note that these stages need not operate in a simple sequential fashion, as when the affiliation goal Focus affects both the Activation stage (by de-activating affiliation irrelevant concepts) and the Binding stage (by selectively binding positive traits more than negative traits to the actor, to produce the positivity bias). Focus has a pervasive top-down role. And all these processes operate unconsciously, even though the stimuli themselves are readily apparent.

How do Spontaneous (Unconscious) and Intentional (Conscious) Social Inferences Differ?

The parenthetic question is less precise because even intentional inferences engage unconscious processes. But framed in this more general way, it is part of the large and important question, ''what is consciousness for?'' Framed more narrowly, it points to a literature that offers clues to the large question.

In early STI research, there were no differences between spontaneous and intentional inferences because the procedures ruled them out. Trait-implying behaviors were (and still are) developed by asking for intentional inferences about them: ''What kind of person is this?'' But newer methods have begun to uncover differences.

Research by Van Overwalle and his colleagues suggests differences in the neurological substrate. Ma, Vandekerckhove, Van Overwalle, Seurink, and Fias (2011) used whole brain fMRI to find areas activated by trait-diagnostic versus non-diagnostic information, under both spontaneous and intentional trait inference instructions. They found that ''spontaneous inferences significantly recruited only core mentalizing areas, including the temporo-parietal junction [TPJ] and medial prefrontal cortex [mPFC], whereas intentional inferences additionally recruited other brain areas, including the (pre)cuneus [PC], superior temporal sulcus [STS], temporal poles [TP], and parts of the premotor and parietal cortex. These results suggest that intentional instructions invite observers to think more about the material they read, and consider it in many ways besides its social impact'' (p. 123). This additional thought might include self-reflection on similar experiences (in PC), thoughts about the bodily motions (in STS), and linking social cues and emotions (in TP). In short, intentional trait inferences involve more areas of the brain than STIs, and more elaboration. Ma et al. (2011) cite other research, using fMRI and ERP, that is consistent with this general picture (e.g., Mitchell, Cloutier, Banaji, & Macrae, 2006; Van Duynslaeger, Van Overwalle, & Verstraeten, 2007).

Typically, intentional trait inferences are made with the goal of forming impressions of the actors. Spontaneous inferences occur under the guise of memorizing or becoming familiar with the information presented. Mitchell, Macrae, and Banaji (2004) showed that trying to remember stimuli's order and forming impressions engage different neural substrate. In what way do these goals engage different cognitive processes, and does consciousness play a distinctive role?

Inference monitoring

There is a paradox in the impression formation literature. In a classic study, Hamilton, Katz, and Leirer (1980) described one person with a list of trait-diagnostic behaviors, with several behaviors implying each of the traits. They showed that memory for the behaviors was better under impression formation than under memory instructions, and impression formation produced more clustering in free recall. The implication was that only the impression formation goal produced trait inferences, which served to organize and improve memory. But Winter and Uleman (1984) showed that people infer traits spontaneously under memory instructions. So why didn't people use these STIs to aid memory in both conditions, and why didn't memory instructions produce clustering in free recall?

Therein lies the paradox. Ferreira et al. (2012) proposed a solution. They hypothesized that impression formation (but not memory) goals establish an "inference monitoring process." This produces "awareness and monitoring of otherwise unconscious inferences relevant to these goals … " which enable them to be "used toward attaining conscious goals. In contrast, spontaneous inferences are not driven by conscious impression-formation goals, even though they may affect later goal-driven behavior" (p. 2). In the first of three studies, they replicated both the Hamilton et al. (1980) free recall and clustering effects, and the Winter and Uleman (1984) cued-recall effect, showing the paradox is not an artifact. Study 2 looked at false recognition of behavioral sentences under the two instructions, and predicted that impression formation (and inference monitoring) would produce fewer errors through better source monitoring (Johnson, Hastroudi, & Lindsay, 1993). It did. In addition, a PDP analysis (Jacoby, 1991) of memory results revealed more controlled processing under impression formation than memory instructions, as should occur with inference monitoring, but no difference in automatic processes. Study 3 showed that a mild cognitive load during encoding reduced controlled processing under impression formation (but not memory) instructions, while leaving automatic processes unaffected. That is, cognitive load interfered with the hypothesized inference monitoring process, but not with automatic processes.

Inference monitoring should be engaged whenever people have a goal that requires the monitoring and use of inferences. Impression formation is one such goal because it requires making inferences from behaviors and then organizing and combining those inferences to produce an impression. Perhaps conflicting information also engages inference monitoring, to permit conflict resolution. Most judgment and decision making entails inference monitoring.

Conscious judgment goals invoke inference monitoring, which produces conscious inferences and impressions. But is consciousness necessary? The Hamilton et al. (1980) effects on memory and clustering have also been found with unconscious goals (Chartrand & Bargh, 1996; McCulloch, Ferguson, Kawada, & Bargh, 2008). This suggests not only that inference monitoring can be unconscious, but also that the goals that invoke it can be too, along with its results and downstream effects. So far, this line of work has produced no evidence for a unique role for consciousness.

Implicit and explicit judgments

Spontaneous trait inferences are implicit judgments. Like implicit attitudes (e.g., Fazio & Olson, 2003), they can affect conscious explicit judgments and other behavior without being conscious themselves. Is there any STI evidence that implicit and explicit judgments differ? Stereotyping is one domain where this might occur, fraught as it is with conflicting goals (Dasgupta, 2004). It is clear that STIs formed about one group member can generalize to other members, if the group has high "entitativity" (coherence; Crawford, Sherman, & Hamilton, 2002).

Wigboldus, Dijksterhuis, and van Knippenberg (2003) showed that when a stereotyped person performs behaviors inconsistent with the stereotype, there is less activation of the trait implied by the behavior. Thus a football player winning a science contest is less likely to activate *brilliant* than an honors student winning a science contest. Gonzalez, Todorov, Uleman, and Thaden (forthcoming) used the false recognition paradigm to show that gender stereotype-inconsistent traits are less likely to be bound to the actors whom they reference. Participants in these studies were less likely to infer *aggressive* when reading that a woman (versus a man) performed an aggressive behavior. Similarly, participants were less likely to infer *caring* when reading that a man (versus a woman) performed a caring behavior. In all cases, behaviors were held constant across gender.

A surprising finding occurred when participants made explicit judgments about the same stimuli (photo-behavior pairs). In this case, and consistent with Biernat and Manis (1994), women behaving aggressively were judged as more aggressive than men, and men behaving caringly were judged more *caring* than women. Counter-stereotypic behaviors led to more extreme explicit judgments while being less likely to result in spontaneous binding of the same traits to the relevant actors. Biernat and Manis (1994) understand their findings as the result of shifting standards. What participants are saying is that while he is aggressive, she is *very* aggressive *for a woman*. So the stereotype of the actor's social category invokes not only that stereotype's content, but also a different standard for calibrating the judgment scale. The findings of Gonzalez et al. (forthcoming) suggest that this only occurs for explicit judgments. Thus conscious judgments include a wider range of information. Perhaps consciousness enables the use of more extensive and remotely related knowledge.

A second dissociation is reported by Saribay, Rim, Uleman, and Kühnen (forthcoming). Noting that existing studies of cross-cultural differences in STI rely on chronic cultural and individual differences, they manipulated (primed) self-construals, using Gardner, Gabriel, and Lee's (1999) pronoun-circling priming task. Even though both spontaneous trait (STI) and situation (SSI) concepts were activated simultaneously, priming had no effect. And even though trait binding was shown in a second study, priming again had no effect. But using the same material as study 1, priming had the predicted effects on explicit trait and situation judgments. Independent self-construal priming led to stronger trait (versus situational) inferences, whereas interdependent self-construal priming did not. Thus priming "I" versus "we" self-consturals affected explicit judgments but not implicit processes, at either the activation or binding stages of STI.

Dissociations between implicit and explicit measures can arise for many reasons (e.g., Gawronski & Payne, 2010). These open interesting avenues for future research.

Conclusion

Spontaneous social inferences occur at encoding, and depend on both automatic and controlled processes, however one defines and measures these. STIs are about actors, and they entail causal concepts. People seem to make multiple simultaneous inferences as well as exhibit processing stages in making unconscious inferences about others (e.g., the Focus, Activate, Bind model). Intentional inferences add layers of complexity as suggested by recent fMRI data and the inference monitoring hypothesis. Discrepancies between implicit and explicit judgments seem particularly useful for distinguishing among these processes. The shapes in the shadows and their relations to each other are slowly emerging.

Short Biographies

Jim Uleman's research has focused on the social cognition of impression formation, for the past 30 years. He has published research articles in most of the leading journals in the field, as well as recent chapters summarizing broad developments in impression formation in the *Annual Review of Psychology* (2008) and *The Oxford Handbook of Personality and Social Psychology* (2012). He has (or had) editorial roles at the *Journal of Personality and Social Psychology, Journal of Experimental Social Psychology, Social Cognition*, and the *Personality and*

Social Psychology Bulletin. His research has been funded by the National Institute of Mental Health and the National Science Foundation. He was educated at Caltech, Michigan, and Harvard. He is a professor at NYU, and directed the social psychology doctoral program there for over 20 years. You can find his vita at *uleman.socialpsychology.org/cv/VITA.BRF.doc and his webpage at http://www.psych.nyu.edu/uleman*.

SoYon Rim is a postdoctoral fellow at the Harvard Decision Science Laboratory at Harvard Kennedy School of Government. SoYon received her B.A. in Psychology and her Ph.D. in Social/Personality Psychology from New York University. Her research centers on understanding the influence of abstraction and self-distancing on causal thinking and the downstream effects of this relationship on self-regulation, counterfactual thinking, and moral decision-making. She also studies causal thinking with respect to implicit person perception - how do perceiver goals and other factors inherent in the social context functionally shape implicit impressions of others and their behaviors? She has published in psychology journals, including the *Journal of Experimental Social Psychology*, and has contributed theoretical chapters in scientific books, including the forthcoming Oxford *Handbook of Social Cognition* and Sage *Handbook of Social Cognition*. More information can be found at http://scholar.harvard.edu/soyonrim.

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Laura Kressel conducts research in the areas of social cognition, and judgment and decision making. Her social cognitive research focuses on the basic representations that support implicit impression formation. She also examines the many ways in which our lay theories (about causality, gender roles, etc.) influence the social inference process. Laura received her PhD from New York University in 2011 and is currently a postdoctoral research associate at the University of Southern California. https://files.nyu.edu/lmk323/public/.

Endnote

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