When people infer traits unintentionally and unconsciously from actors’ behaviors, in what senses might these spontaneous traits refer to the actors? Spontaneous trait inferences “manifestly” refer to the actors if there are direct links in explicit memory from traits to actors. They “tacitly” refer to the actors if trait-irrelevant features of the actor influence their frequency. Three studies examined whether more realistic presentations of trait-implying sentences affect either type of spontaneous trait reference. In each study, sentences were accompanied by photos of either actors, behavior settings, or abstract patterns. Subjects memorized the sentences (Experiment 1), and then to test boundary conditions, read them as distractors (Experiment 2) or visualized them (Experiment 3). These conditions did not affect manifest reference, for which there was no evidence. But tacit reference occurred in Experiments 1 and 3. Other effects, possible underlying processes, vividness and attention, and implications for models of impression formation are discussed.

We have all inferred people’s traits from their behavior. Traits help us to describe people, to organize information, to predict what to expect from them, and to draw conclusions about the causes or reasons for any given behavior. Often these judgments are very deliberate and systematic in
how they evaluate others and use behavioral information to draw inferences. The extent to which inferences proceed deliberately is likely to depend on the personal relevance of the judgment being made, the availability and complexity of relevant information, the situational context, the goals and motivation of the individual perceiver, the personality and the biases that the perceiver brings into the situation, and naturally, the actions of the person with whom we interact. However, this process of characterizing other people in terms of their traits is so ubiquitous and routinized that we often do it quite effortlessly, without conscious deliberation, even when the true cause of others’ actions lies in the situation (e.g., the correspondence bias or fundamental attribution error). We may even make such inferences without intending to, or being aware of them. Uleman and his colleagues (Newman & Uleman, 1989; Uleman, 1987, 1989; Winter & Uleman, 1984) labeled this phenomenon “spontaneous trait inference” (STI).

When trait inferences occur spontaneously, rather than intentionally, their referents are unspecified. Intentional trait inferences usually have an explicit target, so that their referents are clear. But because spontaneous trait inferences (STIs) are unintentional and unconscious, they are not “about” anything in a linguistic or philosophic sense. That is, they have no deliberate “reference” (Frege, 1952), “extension” (Carnap, 1947), or “denotation” (Mill, 1843).

Such traits may not be about the target person in any sense. Trait words themselves do not convey their referents. “Many trait names which we use in describing persons can also be used in describing acts” (Heider, 1944, p. 362; see also Bassili, 1989). Traits are categories that summarize the result of cognitive analyses of social events. Trait terms can characterize a single behavior, a series of behaviors, an actor’s current state, or more long-standing dispositions. Simply because traits can describe an actor’s stable dispositions, there is no reason to assume they always do. The linguistic possibilities do not dictate the psychological actualities. Thus, spontaneous trait inferences from behaviors always refer to the behaviors, but they may also refer to persons performing those behaviors.

Spontaneous trait inferences can be said to refer to the person performing a behavior on the basis of at least two kinds of evidence. We will designate these as “manifest” and “tacit” reference. A spontaneous trait inference manifestly refers the actor if it is linked directly to the actor in memory. In a cued-recall paradigm, this means that the trait would cue explicit recall of the actor’s identity (name, occupation, or other unique identifying feature). Manifest reference is not inevitable. We have all been in situations where we obviously formed impressions of a person and yet could not recall who that person was. You may remem-

ber that someone was extremely insightful in asking questions at the last colloquium but not remember, “Who was so perceptive in questioning the speaker?” This suggests that we can make trait inferences about other people from their behavior without remembering who they were.

It is also possible that information about the actor may affect the nature and/or the likelihood of a spontaneous trait inference. As Heider (1944) noted: “Acts or products are colored by the qualities of the person to whom they are ascribed” (p. 364). A spontaneous trait inference tacitly refers to the actor when this occurs. Here is an extreme, and perhaps uninteresting example. If you read that “The accountant takes the orphans to the circus,” you might spontaneously infer that the accountant or the behavior is KINDHEARTED (Winter & Uleman, 1984). But if you read that “The bus driver takes the orphans to the circus,” this inference is unlikely. In this contrast, the behavior description remains the same, but the actor’s identity changes the behavior to which the same literal description refers. Bus drivers and most other people “take people places” in different ways.

Here is a more interesting example, in which the actor’s identity does not change the behavior but merely its implications. Contrast “The accountant takes the orphans to the circus” with “The social worker takes the orphans to the circus.” The latter may not imply KINDHEARTED as clearly because taking orphans to the circus may be part of the social worker’s job, so that being KINDHEARTED may be discounted as an explanation of this in-role behavior (Thibaut & Riecken, 1955; Trope, 1986). Such an effect of the actors’ identities on a spontaneous trait inference would indicate that the trait tacitly refers to the actor, even if no actor’s identity can be recalled explicitly.

Useful as this example is to illustrate the idea of tacit reference, it also illustrates a potential problem. Spontaneous trait inference has typically been studied with a cued-recall paradigm, in which the effectiveness of trait cues for sentence recall is compared with other cues (for reviews, see Newman & Uleman, 1989; Uleman, 1987). In this paradigm, it is important to rule out retrieval based on pre-experimental semantic associations between the cues and the sentence words. But KINDHEARTED might cue “social worker” simply because of such associations, rather than because the social worker’s behavior is KINDHEARTED. Being KINDHEARTED is part of a social worker’s role. So this association may inflate estimates of the trait’s inference-based links both to the sentence generally and to the actor in particular. And this would inflate estimates of the frequency of spontaneous trait inferences and their manifest reference to the actor, respectively. Similar problems arise in other paradigms that have been used to detect spontaneous trait inferences: recognition probe reaction times
(Newman, 1991; Uleman, Hon, Roman, & Moskowitz, 1993) and constrained word stem completions (Whitney, Waring, & Zingmark, 1992; Whitney, & Williams-Whitney, 1990). One solution to this problem might be to use trait cues' effectiveness only for recall of behaviors, but not for recall of actors, as evidence for STI.

Unambiguously detecting spontaneous trait inference is simpler when actor identities are not semantically linked to the traits that the behaviors imply. Just such actors (e.g., "the accountant") have been used in most prior STI research. So "tacit reference" of spontaneous trait inferences to actors is said to occur when features of the actors affect the nature and/or the likelihood of spontaneous trait inferences, apart from effects of possible semantic associations between actors and traits. This exclusion is important for interpreting retrieval processes, but it is also relevant to encoding. In encoding terms, our definition of tacit reference excludes semantically priming the trait by the actors' identities, but includes any other effects of actors' features on the nature or likelihood of spontaneous trait inferences. Such effects are important because they imply the co-consideration of actor and behavior features in the spontaneous inference process.

Note that a spontaneously inferred trait may manifestly refer to an actor without tacitly doing so, and vice versa. These two kinds of reference are conceptually independent of each other. They are both unintended, and experimental evidence is necessary to establish either one. By contrast, intentional reference is usually established by simply asking the speaker what referent was intended.

This paper reports three studies designed to examine whether presenting actors in a more realistic way than in prior STI research might affect the extent to which spontaneous trait inferences manifestly and/or tacitly refer to sentence actors. In each study, we made the presentations more realistic by accompanying the sentences with photographs of either the actor, the setting for the behavior, or an interesting pattern. Our intuition was that such added realism would produce evidence for both kinds of unintended reference because it would more closely approximate the conditions in which intentional trait inferences occur, and which lead to the development of spontaneous trait inferences (Bassill, 1993; Newman, 1991).

**PRIOR RESEARCH ON MANIFEST REFERENCE**

If a spontaneous trait inference (STI) manifestly refers to an actor, it is explicitly linked to the actor in memory. In the cued-recall paradigm, this means that the trait is an effective retrieval cue for the actor. This paradigm is based on the idea that if inferences are made during the comprehension of text (e.g., "The accountant took the orphans to the circus"), those inferences (e.g., KINDHEARTED) will be encoded and stored along with the sentence itself, and therefore serve as effective retrieval cues for the sentence. These cues must have no pre-experimental semantic associations to words in the sentence, because these associations could serve as alternate bases for retrieval. Demonstrating that an inferred cue's effectiveness depends upon inferences at encoding requires that it be more effective than no cue, and at least as effective as strong semantic associates to the sentence's words. This latter requirement controls for the possibility that weak but undetected semantic associations exist between the inferred cue and sentence words.

In this paradigm, how effective are traits at cuing recall of actors? Not surprisingly, past research has shown that they are less effective in cuing actors than in cuing the behaviors from which they are inferred (cf. Winter & Uleman, 1984; Winter, Uleman, & Cunniff, 1985). More to the point, sometimes trait cues are more effective than no cue (Winter & Uleman, 1984, Experiment 1; Uleman, Winborne, Winter, & Shechter, 1986), but sometimes they are not (Winter & Uleman, 1984, Experiment 2; Winter et al., 1985).

However, these published analyses cannot precisely address the question of a direct link from trait to actor in memory because they do not control for indirect links. (Carlson & Skowronska, 1986, termed these "circular links"; see their Figure 1.) That is, trait cues may enable subjects to retrieve actors' identities indirectly by first retrieving the actors' behaviors, which are linked in turn to the actors. The cued-recall paradigm can only provide evidence that an STI manifestly refers to an actor by demonstrating a direct link between trait and actor, and that requires controlling for the indirect path through the behavior.

One might control for indirect path effects by covarying out trait-cued recall of behaviors from trait-cued recall of actors. Moskowitz (1993) used this strategy and found evidence for direct links between STIs and actors, but only among subjects with a high Need for Structure. These subjects are more likely to engage in social categorization processes (Thompson, Naccarato, & Parker, 1992). The Need for Structure had no effects on non-cued recall of the actors or on trait-cued recall of the predicates (controlling for recall of the actors). Thus for some individuals, direct links between spontaneously inferred traits

1. Meaningful comparisons of trait with semantic cues' effectiveness for recall of actors are not available, because most studies that used semantic cues used semantics associates of the actors (except Winter & Uleman, 1984, Experiment 2).
and actor identities (names in this case) were established in memory. Does this mean that STIs manifestly refer to the actors only for certain individuals? Not necessarily. But it does suggest that only certain individuals form such direct links under simple memory instructions ("Read these sentences carefully because your memory for them will be tested later"). This does not preclude the possibility that, with either more engaging stimulus items or instructions that promote more elaborate processing, such direct links may be found for all subjects.

Uleman and Moskowitz (1993) used a second method to assess such direct links, in a series of cued-recall studies in which subjects’ goals varied. They analyzed recall of actors’ identities within that subset of sentences, for each subject, in which behavior had been recalled. This conditional recall of actors holds constant the indirect path from trait to behavior to actor. As one would expect, they found that when subjects were instructed to form impressions of the actors in trait terms, there was clear evidence that the trait inferences were linked directly to the actors. But these trait inferences were not spontaneous. When the subjects’ goal was to remember the trait-implicating sentences, as in most previous studies, there was no evidence for a direct trait-actor link. Recall of actors’ identities was no higher with trait cues than with no cues, among sentences where behavior was recalled. When their goal was to judge how similar they were to each actor, there was also no evidence that spontaneous trait inferences manifestly referred to the actors. But when the subjects’ goal was to judge the likelihood that they would do what the actor had done, conditional trait-cued recall of actors tended (2-tailed \( p < .08 \)) to be higher than noncued recall.

Further evidence on manifest reference to actors was obtained by reanalyzing the data from Winter and Uleman’s (1984) Experiment 1, where unconditional trait-cued recall exceeded noncued recall of actors under memory instructions. Restricting the analysis to sentences in which behavior was recalled eliminated the superiority of trait cues for recall of actors, indicating no evidence of direct trait-actor links in memory.

Apparently, then, although comprehending trait-implicating sentences under memory instructions reliably produces spontaneous trait inferences, these typically do not refer manifestly to the actors. One

2. One could also examine actor recall for the subset of sentences in which the behavior was not recalled. However, actor recall in this subset is typically close to zero. Moskowitz (in press) used a similar approach which once again revealed the impact of individual differences on STI-actor links. Examining actor recall for only those sentences in which there was some predicate recall, a significantly greater percentage of the actors (37%) were recalled to trait cues for subjects with high personal need for structure scores than for those with low scores (14%).
imply the traits. Instead, it should consist of trait-irrelevant information about the actors.

Delmas (1992, Experiment 2) performed an experiment that meets this requirement more closely, in that he added no trait-implying behaviors. He used memory instructions and French translations of the sentences from Winter and Uleman (1984), where actors were identified by occupations. Half of his actors had occupations that were strongly suggested by the traits, making trait-actor links more natural, and half the actors had irrelevant occupations. (Winter & Uleman, 1984, used only irrelevant occupations.) For example, being “talented” suggested “professor” but not “social worker,” and being “ill-mannered” suggested “truck driver” but not “trader” to pretest subjects. He found that such occupations facilitated spontaneous trait inferences. Under memory instructions, trait-cued recall of behaviors was higher when the traits were suggestive of the occupations rather than unrelated to them, $F(1, 138) = 10.7, p < .001$. These results may appear to provide evidence for spontaneous trait inferences tacitly referring to actors, because the actors’ features changed the likelihood of spontaneous trait inferences. However, these features are also relevant to the traits. Thus as Delmas noted, this effect may have occurred because of the natural relationship between actors and their (e.g., ill-mannered) behaviors, or simply because the occupational stereotypes primed the trait concepts. This evidence is inconclusive because of this priming alternative.

Finally, Claeys (1990) had Dutch-speaking college students read trait-implying behaviors with no actors at all, under memory instructions. Trait-cued recall exceeded semantic-cued recall, indicating the occurrence of spontaneous trait inferences even without an actor. Claeys concluded that “spontaneous encoding of sentences in trait terms . . . has to be interpreted as the categorization of actions rather than as the attribution of traits to actors” (p. 173). Although these results show that spontaneous trait inferences may occur as action categorizations, they do not show that actors have no effects. No sentences with actors were included in the design, so we do not know whether trait-cued recall would have been higher with actors.

THE PRESENT STUDIES

Most previous cued-recall research on spontaneous trait inference has presented subjects with impoverished stimuli, relative to that encountered in daily interactions with other people. For each actor, single behaviors were described in a concrete, unelaborated way. The context was minimal. And actors were identified by a name or occupational role unrelated to the behavior or trait. Such impoverished stimuli were reasonable for exploring the minimal conditions under which spontaneous trait inferences would occur. However, they may make it less likely that STIs refer to the actors, in both senses discussed above. Impoverished representations of the actors probably minimize the likelihood of a direct memory link between spontaneous trait inferences and actors, and reduce actors’ influence on the nature and/or frequency of STIs.

Establishing direct links should depend on the extent to which elaborations of the actor and of the trait inference intersect (i.e., share common associative nodes) at encoding. Imagine that the actor and the trait are items in a list to be learned, under memory instructions. The more intra-list elaboration occurs, the more inter-item links will be established and the more effective trait cues will be at retrieving actors. One might increase elaboration through instructions, but we are interested in spontaneous inferences that take place under simple memory instructions. It may also be possible to increase elaboration by making the materials more complex and interesting, thereby attracting more attention to them and providing more bases for elaborative encoding.

Therefore, in the present studies the to-be-recalled trait-implying sentences were accompanied by color photographs. These photos did not suggest the traits, but they did vary in relevance to the sentence content. They depicted either (a) the actor, (b) the setting for the action or (c) an abstract pattern. If spontaneous trait inferences are tacit about the actor, such complex trait-irrelevant information about the actor should influence their frequency. In addition, pictures of the actors should also increase STIs’ frequency (relative to the abstract pattern condition) because they make the stimuli resemble lifelike conditions more closely—conditions in which trait inferences typically occur. If trait inferences are conceived of as well-practiced procedures (e.g., Bassili, 1993; Smith, in press; Smith, Stewart, & Buttram, 1992) then the more the stimuli recreate the initial learning conditions, the greater the likelihood that the procedures will fire.

It is also possible that photos of settings increase spontaneous trait inferences, for the same reason of increased resemblance to initial learning conditions. Just as an effect of actor photos would demonstrate that STIs tacitly refer to actors, an effect of setting photos would demonstrate STIs tacitly refer to settings as well. (Settings, as well as people, can be friendly, exciting, demanding, etc.)

We also hypothesized that photos of the actors would increase the likelihood of direct memory links between traits and actors, producing
STIs that manifestly refer to actors, by prompting elaborative encoding to link actors and traits. Photos of the setting were included to control for the photos’ relevance to the sentences without specifically prompting trait-actor inter-item elaborations. And photos of interesting abstract patterns controlled for any general effects of attention and the stimuli’s overall interest value.

As noted above, neither kind of tacit reference (to actors and to settings) requires or implies manifest reference. Tacit reference can be detected by looking at the effectiveness of trait cues for recall of behaviors. Greater effectiveness in some conditions indicates that spontaneous trait inferences are more frequent in those conditions. Manifest reference is demonstrated by the effectiveness of trait cues for recall of the actors, given (i.e., holding constant) behavior recall. So there is no statistical or operational reason for the two phenomena to be related to each other.

In the first experiment below, subjects read the trait-implying sentences (accompanied by photos) under memory instructions (as in Uleman & Moskowitz, 1993, Experiment 1; Uleman et al., 1986; and Winter & Uleman, 1984), to test the effect of photos on manifest and tacit reference. In the second experiment, the sentences were read as distractors (as in Lupfer et al., 1990; Uleman, Newman, & Winter, 1992; and Winter et al., 1985), to see whether the effects in Experiment 1 would hold up under such incidental attentional conditions. And in the third experiment, subjects were asked to visualize the events in the sentences as vividly as possible, to see whether such elaborative encoding would increase manifest or tacit reference. No subjects were asked to intentionally form impressions of the actors because such impressions are not spontaneous, and because Uleman & Moskowitz (1993) have already shown that such intentional impressions manifestly refer to the actors.

**EXPERIMENT 1**

In this experiment, subjects read trait-implying sentences that were accompanied by one of three kinds of color photos. The photos depicted either an actor, a setting appropriate for the behavior, or an abstract pattern. We predicted that actor photos would increase spontaneous trait inferences’ manifest reference to actors, that is, direct memory links between trait cues and actors. We also predicted that actor photos would reveal spontaneous trait inferences that tacitly referred to actors.

Although our hypotheses concern encoding processes, the photos might primarily affect retrieval processes. For example, rather than an actor photo producing direct trait-actor links at encoding, the trait cue might aid in retrieving the actor’s appearance from memory, which in turn could cue the actor’s verbal identity. To detect such image-mediated retrieval effects, about half the subjects saw the photos at retrieval as well as at encoding. Interactions between this Photo-at-Retrieval factor and Cue Type would indicate a significant role for these visual images at retrieval, because any such “image-mediation” effects should be larger with the photos actually present at retrieval.

Thus the basic design of Experiment 1 was a 2 (Photo-at-Retrieval: yes, no) x 3 (Photo Type: person, setting, pattern) x 2 (Cue Type: trait, no cue) x 2 (Sentence Part: actor, predicate or behavior) ANOVA, with only the first factor between subjects. In addition, two between-subjects counterbalancing factors were included: Order and Pairing. These are described below, but they had no significant effects.

**METHOD**

**Subjects.** Seventy NYU students volunteered to participate, to partially fulfill requirements of their Introductory Psychology course.

**Materials.** The 20 trait-implying sentences included buffers in the first and last positions and 18 others drawn chiefly from Winter et al. (1985). In contrast to prior studies, actors were identified by name rather than occupational role. Each sentence was paired on a slide with one of three types of color photos: a person who could be the actor, a setting where the behavior could have taken place, and an abstract color pattern. The behavior settings included a large party, a restaurant, an urban street, and an office; none included distinct people. Neither the actor nor the setting strongly suggested particular sentences, because counterbalancing required that they be paired with different sentences across subjects. These photos created a three level, within-subjects factor called Photo Type. The two buffer sentences always appeared with abstract patterns. The other 18 sentences appeared in one of two constrained random orders, creating a two-level, between-subjects Order factor.

Sentences were also assigned to one of six blocks, with three sentences in each block. Pairs of blocks were then rotated through a Latin Square design that associated each block equally often with each of the three Photo Types and each of the two Cue Types (traits and no cues). Thus actor, setting, and pattern photos were systematically rotated among sentences. Pairs of blocks contained sentences roughly equivalent in valence and strength of trait implication (based on
pretesting). This produced a six-level between-subjects Pairing factor. It was operationalized through six different cued recall sheets, each containing trait cues for half of the sentences and no cue for the others.

In addition, 34 of the 70 subjects’ recall sheets included small black-and-white versions of the photos that had preceded at encoding. (Photos were black-and-white simply for convenience and economy of reproduction.) This produced a two-level, Photo-at-Retrieval factor.

Procedure. Subjects were run in small groups, with photos either present or not on the Recall Sheets at retrieval. Subjects signed consent forms that described this as a study of memory for social information. Then they read Instruction Sheets that described the specifics of the task, including examples of responses and blanks for responses to the 20 sentences. The instructions asked subjects to "... study each sentence carefully for a memory test which will occur later. Memorize each sentence as fully as possible by repeating it silently to yourself. For each time you repeat a sentence, place a check mark after that sentence’s number on the paper below.”

Then a Kodak Carousel projector displayed slides, each with a sentence and photo, on the wall for 8 s each with 2 s between slides. After the last (buffer) slide, subjects completed an Awareness Questionnaire. It asked subjects for an open-ended description of “what went through your mind as you read that sentence. What did you think of ...” Responses were scored simply for the presence (1) or absence (0) of thoughts about the actor’s traits or personality. The questionnaire also requested four ratings, on 10-point scales, of how much they experienced visual imagery to the sentences, verbal associations to sentence words, judgments about causality or responsibility for sentence events, and judgments about the personalities or personal qualities of sentence actors.

To allow additional time for short-term memory decay before cued recall, subjects then worked on an anagram task for approximately 2 minutes. The task was presented on three slides, each containing three scrambled words. Then the Cued Recall Sheets were distributed for 10 minutes of recall. Finally, subjects were debriefed and thanked for their participation.

RESULTS

As in most past research, there was no evidence that subjects had any accurate awareness of making spontaneous trait inferences.3

The full design of the experiment was a 2 (Photo-at-Retrieval: yes, no) x 3 (Photo Type: person, setting, pattern) x 2 (Cue Type: trait, no cue) x 2 (Sentence Part: actor, predicate or behavior) x 2 (Order) x 6 (Pairing) ANOVA with the first factor and the last two factors between subjects. A preliminary ANOVA indicated that the last two counterbalancing factors had no significant effects, so they were dropped from further analyses. The design of interest was a 2 x 3 x 2 x 2 ANOVA. The dependent variable was the proportion recalled, for each sentence part.4

Of the 15 possible main effects and interactions in this design, all but three were significant. In order to understand the four-way interaction better, F(2, 136) = 3.67, p < .028, recall of actors and recall of the predicates were re-analyzed separately.

Recall of the Predicates showed the following expected main effects. Recall was better with photos of persons (46) and settings (42) than patterns (.23) at encoding, F(2, 136) = 47.08, p < .0005; better with trait cues (46) than without (.27), F(1, 68) = 42.47, p < .0005; and better with photos-at-retrieval (.44) than without (.28), F(1, 68) = 16.58, p < .0005. None of this is surprising or relevant to our hypotheses. In addition, there were two interesting 2-way interactions.

A Photo Type x Cue Type interaction on recall of the predicates, F(2, 136) = 8.29, p < .0005, supported the hypothesis that pictures of actors at encoding would make spontaneous trait inferences more likely than pictures of either relevant settings or abstract patterns (see Figure 1). With no trait cuing, person and setting pictures at encoding confer a

3. Evidence of any personality- or trait-related thoughts on the open-ended question was scored “1,” otherwise “0.” Only 3 of the 60 subjects (5%) from whom we got data showed such awareness. To see whether subjects had any accurate awareness of making spontaneous trait inferences, trait-cued recall (under each of the 3 encoding conditions) was then correlated with this open-ended scale and with the ratings of causal and personality thoughts/ frequencies. Only 1 of these 18 rs (3 scales x 3 encoding conditions x 2 sentence parts) was significant (p = .047), but it indicated that fewer causal thoughts accompanied greater trait-cued predicate recall.

4. Sentences consisted of four parts: an actor and three predicate parts: verb, object, and phrase. Presence (1) or absence (0) of each of the four parts was scored using a gist criterion. Recall of predicate (behavior) parts correlated highly, so they were summed for analyses.

Subjects wrote the recalled sentences opposite recall cues on the recall sheets. Occasionally, recall was written opposite a different cue from the one that we intended. There are two ways to handle this “mismatched cuing.” The most frequent method is to exclude it. This method is based on the assumption that subjects know which cues worked to cue recall of each sentence, and can accurately match their recall to the cue that evoked it. But this assumption is arguable, so it is reasonable to include the mismatched cue recall in recall scores. That is what we have done in these studies. Experiment 3 is the only one where this makes a difference; and that difference is noted there.
SPONTANEOUS TRAIT INFERENCESSignificant (above). Apparently the self-generated cues in the no-cue condition were just as effective as our trait cues. People were simply better at recalling behaviors originally accompanied by photos of persons than of settings or patterns. This suggests that people’s usual strategies for recalling behaviors depend more on encoding elaborations of persons than of settings. That is, independent of what spontaneous trait inferences refer to (this was unaffected by cue type), people’s usual strategies for retrieving behaviors appear to be more person-based than setting-based.

Recall of the Actors. People’s memory for the name of the actor produced only two effects. It was higher for cued (.116) than non-cued (.077) recall, F(1, 68) = 6.71, p < .012. And it was higher with person (.132) than with setting (.093) or pattern photos (.064), F(2, 136) = 7.90, p < .001. But there were no significant interactions, ps > .16. And the conditional analysis of recall of the actors, given some recall of the predicates, showed trait-cued (.045) was actually lower than non-cued (.152) recall of the actors, F(1, 69) = 14.5, p < .0005. There was no interaction with Photo Type, p > .50. Thus, consistent with most past research, there was simply no evidence that spontaneous trait inferences “manifestly referred to” actors. Relative to no cues, trait cues did not increase actor recall over and above what could be attributed to the indirect effect of behavior recall.

DISCUSSION

Consistent with prior research, this study produced no evidence that spontaneous trait inferences refer manifestly to actors, that is, are linked directly to the actors in memory. But it did produce evidence that they refer tacitly to actors, because they are more likely to occur with photos of actors (rather than relevant settings or irrelevant patterns) present at encoding.

Furthermore, this study showed that photos of actors at encoding aided recall of behaviors more than photos of settings or patterns did, regardless of the retrieval cue. This suggests that people’s ordinary strategies for recalling behavior are more person-based than setting-based, and that these person-based strategies were not particularly related to our trait retrieval cues.

In addition, there was no evidence that the photos’ effects on cued recall were primarily a result of retrieval processes. There were no significant Cue Type x Photo-at-Retrieval effects. Because Experiment 1 failed to show any such interactions, photos were only presented at encoding in subsequent studies.
More generally, this study suggests that when the to-be-remembered stimuli are made more realistic than in prior spontaneous trait inference studies by including photos of the actors, spontaneous trait inferences are more likely. This suggests that spontaneous trait inferences may be more frequent in face-to-face encounters with others than they are with text descriptions alone, unaccompanied by visual person stimuli. This finding is not only intuitively reasonable, but it is consistent with conceiving of spontaneous trait inferences as social cognitive productions. Productions systems (see Smith, in press; Smith et al., 1992) are “if-then systems,” cognitive operations that are executed whenever a set of prior conditions are met. If trait inference procedures are generally useful and well-rehearsed procedures for understanding social events, then triggering their execution may not require explicit impression formation goals (Newman & Uleman, 1989). And if they are more than merely text comprehension procedures or memorization mnemonics, then presenting the text in more realistic social contexts—thereby meeting a larger set of the prior social “if” conditions—should make them more likely. This is precisely what occurred.

The evidence that STIs tacitly referred to the actors implies that actor and behavioral information were given co-consideration at encoding. The evidence that STIs did not manifestly refer to the actors implies that this co-consideration was insufficient to produce memory links between trait and actors. This raises the interesting question of whether or not enough co-consideration occurs under incidental learning conditions to produce even tacit reference. Experiment 2 was designed to answer this question, by having subjects read the trait-implying sentences as distractors rather than as to-be-remembered stimuli.

**EXPERIMENT 2**

In this experiment, we changed subjects’ processing goals to see how robust the effects of the first experiment were. In that experiment, there was evidence that spontaneous trait inferences tacitly refer to actors, in that actor photos at encoding made spontaneous trait inferences more likely (see Photo Type x Cue Type interaction). And there was evidence that the actor photos made the behaviors more generally memorable, apart from our trait cues. Would these effects hold up under more incidental learning instructions?

Winter et al. (1985) showed that spontaneous trait inferences occur even when the trait-implying sentences are read as distractors, and subjects believe their primary goal is to memorize strings of digits. Lupfer et al. (1990) and Uleman et al. (1992) replicated this result. But none of these studies were designed to reveal whether spontaneous trait inferences tacitly refer to actors under such incidental learning conditions.

**METHOD**

Sixty-six volunteers from Introductory Psychology served as subjects, in partial fulfillment of course requirements.

The same materials were used as in Experiment 1 (the condition with no photos at retrieval), with the following exceptions. The Instruction Sheet described the study as involving memory for digits in the face of distractions. It contained 20 blank lines, one for each trial. On each trial, subjects wrote to-be-remembered digits on a line after reading the distractor sentence and noting how many times they had read it.

Each of the 20 trials began with two slides, each containing two digits for subjects to memorize. This digit task is similar to the “easy digit condition” of previous studies (Uleman et al., 1992; Winter et al., 1985), and should not interfere with spontaneous trait inferences. These were followed by an 8 sec. “distractor” sentence presentation. Subjects read the sentence twice, silently to themselves, and then wrote the four memory digits on the Instruction Sheet. Thus the cued recall test at the end was completely unexpected, rather than anticipated as in Experiment 1. Otherwise the procedure was the same as in Experiment 1.

**RESULTS**

There was no evidence that subjects had any accurate awareness of spontaneous trait inferences.6

6. Awareness was examined as in Experiment 1. Only two subjects showed any awareness of personality- or trait-related thoughts on the open-ended question. Only two of these 18 rs (3 encoding conditions x 3 scales x 2 sentence parts, df = 65) with trait-cued recall were significantly positive, and both occurred with the setting photos at encoding. None of the correlations for person photos at encoding even approached significance.
The basic design was a 3 (Photo Type: person, setting, patterns) x 2 (Cue Type: trait, none) x 2 (Sentence Part: actor, predicate) ANOVA, with all factors within subjects. (As in Experiment 1, the two between-subject counterbalancing factors had no effect and are thus omitted from these analyses.) The dependent variable was the proportion of actors and predicates (behaviors) recalled, to both correct and mismatched cues (see footnote 4).

All the factors produced main effects. Total sentence recall was higher when photos of persons (.117) rather than settings (.093) or color patterns (.063) had been present at encoding, $F(2, 130) = 9.67, p < .0005$. It was higher for trait cues (.122) than no cues (.060), $F(1, 65) = 22.8, p < .0005$. And it was higher for predicates (.170) than actors (.013), $F(1, 65) = 127, p < .0005$.

Neither the predicted Photo Type x Cue Type, nor its three-way interaction with Sentence Part were significant, $Fs < 1.2, ps > .30$. Replicating the evidence that spontaneous trait inferences tacitly refer to actors requires these interactions, so there is no evidence of tacit reference under these incidental learning conditions.

However, there were two other effects. A Cue Type x Sentence Part interaction, $F(1, 65) = 24.48, p < .0005$, showed that recall of the predicates was higher with trait cues (.231) than no cues (.108), but that recall of the actors did not differ (.013 and .012, respectively). This simply replicates past findings for spontaneous trait inferences under incidental learning instructions (Uleman et al., 1992; Winter et. al, 1985), and is not relevant to our hypotheses.

More interesting was a Photo Type x Sentence Part interaction, $F(2, 130) = 10.08, p < .0005$. Regardless of cuing condition, recall of actors was unaffected by which photos appeared at encoding (ranging between .008 and .018), but recall of predicates was affected. It was higher when the photos were persons (.222) than settings (.169), which was higher than when they were patterns (.118), $F(65) > 2.2, ps < .03$. So as in Experiment 1 without photos at recall, Photo Type produced the same ordering for behavior recall, unqualified by Cue Type. This suggests that person photos were again most effective at prompting more (or deeper) elaborations of the behaviors at encoding, and color patterns were least effective. As in Experiment 1, the design does not permit us to identify the content of these elaborations, but it is clear that they were not primarily the traits we used as cues, because there was no interaction with Cue Type.

There were no differences in recall of the actors among any of the conditions in this experiment. Nevertheless, we analyzed recall of the actors among those sentences in which a subject recalled some of the predicate, thereby controlling for the indirect route to actor recall through behavior recall. This conditional recall of actors showed only a tendency for cued-recall (.007) to be lower than noncued (.033) recall, $F(1, 65) = 3.88, p < .053$. Thus there is no evidence that under incidental learning instructions, spontaneous trait inferences manifestly refer to actors.

**DISCUSSION**

We initially hypothesized two effects of actor photos on spontaneous trait inferences. First, they might prompt enough elaborative encoding of the inferred trait and the actor to produce a direct link in memory between trait and actor, thus producing spontaneous trait inferences that manifestly refer to actors. This has not occurred in either experiment. Second, they might increase the likelihood of spontaneous trait inferences that tacitly refer to the actors. That did occur in Experiment 1, but not in Experiment 2. Apparently tacit reference under these conditions requires more-than-incidental comprehension strategies.

These studies revealed a third, unanticipated effect of actor photos. In both experiments, behavior recall was higher when actor photos, rather than setting or pattern photos, were present at encoding. This effect did not depend on cue types. It indicates that the kinds of retrieval strategies people ordinarily use to recall behaviors are more effective when those behaviors have been encoded with visual representations of the actors. Perhaps the actor photos promoted deeper, more elaborate encoding that is not particularly trait-related. Or perhaps the actor photos were more memorable than the setting or pattern photos, thereby providing a better path to behavior retrieval. This second possibility seems less likely because no such effect occurred for recall of the actors in either experiment. In any case, the effect occurred even under the incidental learning conditions of Experiment 2. We expected it to replicate in Experiment 3.

**EXPERIMENT 3**

The most surprising result from Experiment 1 was the lack of any evidence that spontaneous trait inferences manifestly refer to actors, even when their photos were present at encoding and retrieval. Our assumption from the outset of this research (Winter & Uleman, 1984) was that spontaneous trait inferences are about actors rather than merely behaviors, in spite of the doubts of our colleagues (Higgins &
Bargh, 1987). Therefore we performed another study with conditions more likely to reveal manifest reference.

In this experiment, we asked subjects to visualize the events described in the sentences as vividly as possible. We had two objectives. First, we wanted to see if we could facilitate a direct memory link between spontaneous trait inferences and actors. It is well known that visualization or imagery instructions increase recall (Paivio, 1971), probably because they promote more elaborative encoding than general memory instructions. So one set of analyses looks at the results within this visualization instruction. It also seemed possible that visualization would have no effect, relative to the memory instruction in Experiment 1, because visualization may have been precisely what was prompted by the visual backgrounds that all subjects saw at encoding. Seeing pictures of people and relevant settings might have prompted subjects to visualize each sentence in Experiment 1. In that case, explicit visualization instructions should produce identical results. So a second set of analyses compared these results to those under the memory instructions in Experiment 1.

METHOD

Thirty-five volunteers from Introductory Psychology served as subjects, in partial fulfillment of course requirements.

The materials and procedure were the same as in Experiment 1 (in the condition without photos at retrieval), with two exceptions. The Instruction Sheet described the study as involving mental imagery and visualization of social events. Subjects were asked to visualize each sentence as vividly as possible, and then after each sentence was shown for 8 sec., to rate on a scale from 1 to 9 how vividly they were able to imagine the sentence event. In addition, the cued recall test at the end was completely unexpected rather than anticipated by memory instructions.

RESULTS

There was no evidence that subjects had any accurate awareness of spontaneous trait inferences.7

7. Awareness was examined as before. No subjects showed any awareness of personality- or trait-related thoughts on the open-ended question. Two of the 16 correlations with trait-cued recall were significant, but only one was positive. For those sentences accompanied by the setting photo at encoding, trait-cued recall of the predicates was associated with more personality-related thoughts, r(30) = .37. None of the other relevant correlations (particularly those for person photos at encoding) even approached significance.

The basic design was a 3 (Photo Type: person, setting, pattern) x 2 (Cue Type: trait, none) x 2 (Sentence Part: actor, predicate) ANOVA, with all factors within subjects. (The two between-subjects counterbalancing factors again had no effects, and were therefore dropped from these analyses.) The dependent variable was proportion of actors and behaviors recalled, to both correct and mismatched cues (see footnote 4).

As expected, all the factors produced significant main effects. Recall was higher for person (.33) than setting (.20) or pattern (.14) photos, F(2, 68) = 28.4, p < .0005. It was higher for trait cues (.31) than no cues (.14), F(1, 34) = 39.2, p < .0005. And it was higher for predicates (.40) than actors (.05), F(1, 34) = 245, p < .0005.

More interestingly, the Photo Type x Cue Type x Sentence Part interaction predicted from Experiment 1 replicated, F(2, 68) = 3.63, p < .032. There was also a 2-way Photo Type x Cue Type interaction, F(2, 68) = 6.32, p < .003.

Recall of the Predicates. Noncued recall of the predicates (see Figure 2) was affected by photo type at encoding, replicating the general effect of photos found in both previous experiments, regardless of cue type. Recall of the predicates with actor photos was slightly higher (.34) than with setting photos (.23), t(34) = 1.60, p < .118, and clearly higher than with pattern photos (.18), t(34) = 2.42, p < .021.
But there was also an effect of photos specific to spontaneous trait inferences. Photos had a much larger effect on trait-cued than on non-cued recall. Trait-cued recall of the predicates was much higher after a person (.83) than a setting (.47) or a pattern (.34) photo, t(34) > 4.3, ps < .0005. This replicates the finding in Experiment 1 that spontaneous trait inferences tacitly refer to the actors, since presentation of photos of the actors increased the frequency of STIs in both studies.

Recall of the Actors. Unlike Experiment 1, noncued recall of the actors was not affected by photo type at encoding, but trait-cued recall of the actors was. Trait-cued recall of the actors was higher after person (.12) than pattern (.03) photos at encoding, t(34) = 2.72, p < .01, and marginally higher than after setting photos (.06), t(34) = 1.87, p < .07. This suggests that under visualization instructions, spontaneous trait inferences are linked to actors in memory. However, this analysis does not reveal whether the memory links are direct or indirect. To test for the direct link alone, we analyzed recall of the actors among sentences with some recall of the predicates, as described above. This conditional analysis showed no main effects or interactions, ps > .19. Thus, there was no evidence that spontaneous trait inferences manifestly referred to actors, i.e., were directly linked to them in memory.

In short, visualization instructions followed by an unexpected cued-recall test produced evidence of spontaneous trait inferences, and also replicated the evidence from Experiment 1 that spontaneous trait inferences tacitly (but not manifestly) refer to the actors. They also replicated the unpredicted finding that actor photos at encoding facilitate noncued recall of the behaviors. And uniquely in this set of studies, they produced evidence of indirect memory links from spontaneous trait inferences to actors through behavior recall.

Comparison with Experiment 1. It seemed possible that the results of Experiment 1 occurred because the photos at encoding suggested visualization as the preferred mnemonic encoding strategy. To examine this, the visualization data were compared directly with the memorization data from Experiment 1 without photos at recall, by combining them into a single ANOVA with a two-level Instruction factor. As the results above might suggest, there were many differences. There were significant interactions between Instruction, Sentence Part, and Photo Type. But the tendency for visualization to produce higher recall than memorization was not reliable, F(1, 69) = 2.93, p < .091. And there were no significant interactions between Instruction and Cue Type, ps > .20. That is, memory and visualization instructions had essentially the same effects on the role of spontaneous traits in cueing sentence recall. The differences between the two studies in recall of the actors noted above were too small to be reliable in an overall F test.

In spite of these studies' similarities in the effects of Cue Type, there are too many other differences to conclude that photos at encoding in Experiment 1 simply prompted subjects to visualize as a mnemonic. Even though they were only indirect and not direct links, Experiment 3 was unique in producing evidence of any memory links between trait cues and actors.

DISCUSSION

The most surprising finding is the failure of visualization to produce any evidence of a direct link between spontaneous trait inferences and actors. These three studies provide no evidence that spontaneous trait inferences refer manifestly to actors. So pending evidence from more sensitive paradigms, and with the exception of Moskowitz's (1993) subjects with high need for structure, it appears that spontaneous trait inferences manifestly refer to only behaviors, not to actors. This supports suggestions by Bassili (1989), Claey's (1990), and Higgins and Bargh (1987).

On the other hand, we have replicated evidence that spontaneous trait inferences refer tacitly to actors. More vivid actors do make spontaneous trait inferences more likely. So spontaneous trait inferences are about actors, in the sense that characteristics of the actors that

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9. There was a significant interaction of Instruction with Sentence Part, F(1, 69) = 21.7, p < .0005. Predicates were better recalled under visualization (.40) than memorization (.29), t(69) = 3.33, p = .001; but actors tended to be better recalled under memorization (.083) than visualization (.048) instructions, t(69) = 1.87, p = .066. There was also a significant interaction of Instruction with Photo Type, F(2, 138) = 3.22, p = .043, and a three-way Instruction X Photo Type X Sentence Part interaction, F(2, 138) = 3.39, p = .037. Total recall with person photos at encoding was better under visualization (.33) than memorization (.24), t(69) = 2.64, p = .006; but it did not differ with setting (.20 and .17, respectively) or pattern (.14 and .14) photos at encoding, t(69) = .1. A three-way interaction occurred because predicates with person photos were recalled better under visualization (.57) than memorization (.38) instructions, t(69) = 4.37, p < .0005; and this tended to be true with scene backgrounds as well (.35 and .27, t(69) = 1.76, p = .084). But actors with pattern photos were recalled better under memorization (.069) than visualization (.019) instructions, t(69) = 2.47, p = .016.

8. There were other effects. The effect of photos was much larger on behavior (predicate) recall than on actor recall, Photo Type x Sentence Part F(2, 68) = 17.4, p = .0005. In addition, there was the usual Cue Type x Sentence Part effect, F(1, 34) = 33.8, p < .0005. Analyses of only that recall written next to correct cues on the Cue Sheets produced essentially the same results except that two interactions failed to reach significance: Photo Type x Cue Type, F(2, 68) = 1.57, p = .22, and the 3-way interaction, F(2, 68) < 1.0.
do not themselves imply traits can nevertheless affect the likelihood of spontaneous trait inferences. To paraphrase Heider (1944), the categorization of acts is "colored by the qualities of the person to whom they are ascribed" (p. 364).

Some of the effect of photos at encoding in Experiment 1 may have occurred because they prompted subjects to use visualization as a mnemonic. There was little overall difference in the effects of cues in results between Experiments 1 and 3. But explicit visualization instructions did have additional effects in Experiment 3. And with visualization, actor photos at encoding increased trait-cued recall of the actors, through the indirect rather than the direct retrieval route.

GENERAL DISCUSSION

These three studies were designed to examine two ways in which spontaneous trait inferences from behaviors might be about the actor performing the behavior. First, we defined "manifest reference" as occurring when there is a direct link in memory between the trait inference and the actor's identity, rather than no link or merely an indirect link from the trait through the behavior to the actor. Second, we defined "tacit reference" as occurring when the actor's trait-irrelevant characteristics influence the likelihood or nature of spontaneous trait inferences themselves. Previous research had found little evidence that spontaneous trait inferences refer manifestly to actors when subjects are under memory instructions (but see Moskowitz, 1993). No previous research has addressed tacit reference.

In these studies, we manipulated whether the actors' photos were present when subjects read the trait-implying sentences. We expected that presenting the actors' photos, thereby increasing the realism of the behavior descriptions as well as the actors' vividness, would produce evidence for direct memory links under memory instructions. We obtained no support for that expectation, either under memory instructions (Experiment 1), incidental reading instructions (Experiment 2), or visualization instructions (Experiment 3). Analyses of conditional recall of actors (within the subset of sentences in which subjects recalled the behavior) showed that trait cues did not increase recall of the actors' identities.

On the other hand, photos of actors at encoding (rather than photos of relevant settings or abstract patterns) did make spontaneous trait inferences more likely under both memory (Experiment 1) and visualization (Experiment 3) instructions, as shown by higher rates of trait-cued recall of behaviors. Unlike results of previous research (Delmas, 1992; Lupfer et al, 1990), this effect of actor information cannot be attributed to any prior associations between the actor and the spontaneous trait inference. So our results demonstrate that spontaneous trait inferences tacitly referred to the actors, under these two processing goals. Only when the trait-implying sentences were read as distractors in a "digit memory study" did actor photos at encoding have no effect on the likelihood of spontaneous trait inferences. Tacit reference seems to be occur more readily than manifest reference.

Finally, the actors' photos had an unpredicted effect in all three studies. In noncued free recall conditions, actor photos at encoding made behavior recall more likely. This effect did not depend on cuing conditions, so it says nothing about spontaneous trait inferences. But it does suggest the actor photos prompted deeper or more elaborate encodings of behaviors than did the other photos, even under the incidental distractor conditions of Experiment 2. And this suggests that person-based encodings of behavior may be more natural or "more proceduralized" than setting-based encodings.

The actor photos had reliable effects on both the frequency of spontaneous trait inferences (i.e., on tacit reference in the Photo Type x Cue Type effects in Experiments 1 and 3) and on behaviors' general memorability (in all three studies). It is interesting that both Brewer (1988) and Gilbert and Krull (1988) have demonstrated the importance of nonverbal cues in impression formation, showing that nonverbal cues are processed more easily and that their effects are harder to disrupt than verbal information. But two striking differences between those programs of research and the present studies should also be noted. First, in most of those studies, the judgments or impressions were formed intentionally, not spontaneously (i.e., unintentionally). Similar effects might be expected for spontaneous impressions, but that remains an interesting question for future research. Second, the nonverbal actor information used in that research was substantively relevant to the traits, judgments, or impressions. Gilbert & Krull's (1988) visual actor information conveyed trait information. This contrasts with our studies, in which actor information was unrelated to the traits. In fact, actor photos were systematically rotated among the sentences specifically to counterbalance any of the photos' possible trait implications. The present studies concern the effects of simply presenting actors visually, without conveying any trait-related information beyond what is conveyed by the verbal behavior descriptions. More visual presentations of the actor, not visual presentation of trait relevant information, had the effects described above.

If we simply ask whether spontaneous trait inferences are more accurately characterized as behavior descriptions or as actor descrip-
tions, the present results clearly favor behavior descriptions. Whitney, Davis, and Waring (1993) have recently come to the same conclusion, using an entirely different method. Their subjects, in "a study of reading comprehension," read four-sentence paragraphs in which the last sentence implied a trait. The first sentence was either neutral, or it implied a consistent or inconsistent trait. Each paragraph was followed by either a factual question, an impression formation question, or an impression-relevant inference question (as a between-subjects factor, after Whitney et al., 1992). The dependent variable was reading times for the last sentences. In the factual task, they were no different among conditions. In the impression formation task, reading times for the last sentence were faster when it was consistent with the trait implications of the first sentence, and slower when it was inconsistent, compared to when the first sentence had no trait implications. This is what one would ordinarily predict from impression formation research. On the other hand, in the impression-relevant inference task, the only effect was that reading times for the last sentence were faster than the no-trait implication condition for consistent sentences; inconsistent sentences did not differ. This seems to suggest priming effects, but not actor characterization processes. This interpretation was supported by their second study.

NOTES TOWARD A PROCESS MODEL OF THESE RESULTS

What kind of processing model might account for these results? First, the model should emphasize encoding rather than retrieval, because variations in encoding conditions across these studies produced the effects. (There is by now considerable evidence that spontaneous trait inferences are primarily an encoding phenomenon; see Moskowitz & Roman, 1992; Newman & Uleman, 1990; Roman, Uleman, Hon, & Moskowitz, 1990; Uleman & Moskowitz, 1993; and Uleman et al., 1992).

Second, although the results suggest that different instructions (goals) produced differences in the amount of elaborative encoding across studies, the instructions were quite general, and they underspecified the nature of the elaborative encoding. For example, there are many strategies for memorizing text, including simple repetition, forming particular kinds of verbal associations, the method of loci, and other mnemonics involving visualization. So although instructions to memorize or to visualize seemed to produce extensive elaborative encoding, they left the precise nature of this elaboration unspecified. Therefore, the precise nature of subjects' encoding was open to influence by other factors such as the photos.

Third, the photos (along with instructions) did influence both the degree and the type of elaborative encoding. In all three studies, noncued recall of the behaviors was higher when the photos of an actor (rather than a relevant setting or abstract pattern) were present at encoding. This suggests that actor photos prompted elaborations of the behavior, even in the incidental reading conditions of Experiment 2, but these elaborations did not correspond to the traits we used as cues. Under the two instructions that called for more elaborative encoding but left its nature under-specified (memorization and visualization), the photos influenced the specific type of elaboration that occurred. Actor photos increased trait-relevant categorizations of the behavior, thereby increasing trait-cued recall of the behaviors.

This result is consistent with the literature on vividness. Most scholars (cf. Eagly & Chaiken, 1993) find evidence for reliable effects of vividness on judgments, although there had been some doubt about their existence (Taylor & Thompson, 1982). These effects are usually explained in terms of increases in attention at encoding, as a mediating process. Our results are unique in providing evidence of vividness effects on unintended inferences, rather than on intended judgments. And they indicate that the vividness of one element of the stimulus (the actor) may affect encoding elaborations of a different element of the stimulus (the behavior), without directly linking them in memory. That is, the co-consideration of actor and behavior features that seemed to produce evidence of tacit reference did not produce evidence of manifest reference. Future research should give more consideration to how instructions (subjects' goals) interact with vividness to determine the precise nature of encoding elaborations of both the focal and nonfocal stimuli.

The results suggest two remaining questions about recall of the actors. First, trait-cued recall of the actors was highest under visualization instructions with person photos, and the conditional analysis indicated that this was mediated by, rather than independent of, behavior recall. Why did this effect only occur under visualization? Two possibilities come to mind. Trait-cued recall of the predicates was significantly higher under visualization (.83) than memorization (.61) instructions, \( t(103) = 3.38, p < .001 \), so the mediator (behavior recall) was more frequent. In addition, visualization may have produced more integration, or "intra-item elaboration" of the sentence elements. Thus,

10. Behaviors can be categorized in many other ways, including non-trait gists (e.g., Winter et al., 1985) or goals (e.g., Read, 1987). Current evidence indicates that these ways of categorizing behavior are not mutually exclusive and may even co-occur to some degree (see Uleman & Moskowitz, 1993). But the trait-cued recall method used here will only detect trait inferences.
once trait-cued recall of the predicates occurred, the behavior was more likely to cue recall of the actors. Either or both of these effects could explain the higher trait-cued recall of the actors under visualization.

Second, why did actor photos fail to produce the predicted direct memory link between spontaneous trait inferences and actors, and thereby fail to show manifest reference? Our prediction may have been based on a common but faulty intuition about the effect of vividness on memory. Fiske and Taylor (1991) note that people have predicted similar effects for salience (which resembles vividness), and that salience does not reliably increase recall. Actor photos did increase recall of the actors in our Experiment 1, but not in Experiment 3; and this effect was unrelated to trait cues. So whatever effect actor vividness had on elaborating the actor, the elaborations were not relevant to the trait cues.

Several features of our materials may have contributed to this null effect. First, as in most past research and by design, the actors’ verbal identities were unrelated to the traits implied by their behavior. Unlike the occupations used by Delmas (1992), there was nothing in our actors’ identities to suggest the traits. In addition, even if the photos enhanced subjects’ visual elaborations of the actors and thereby improved memory for their appearance (a possible effect we did not measure), the photos were arbitrarily paired with actors’ identities, which were simply names. Subjects had only one trial to learn the names of 20 people, 6 of whom were seen in photos. Even if the trait cue prompted recall of the actor’s appearance, recalling the actor’s name (our measure) required another link in memory. That is, actor photos may have made the actors more memorable without affecting recall of their names.

These speculations suggest that direct links between spontaneous trait inferences and actors might be detected under other conditions. For example, a more sensitive measure of recall of the actors (e.g., a recognition matching test for photos and spontaneous trait inferences) might work. Or a set of stimuli with a priori links between the actors’ photos and their verbal identities (e.g., a man in an apron holding a cleaver paired with the identity “butcher”) might reveal direct spontaneous trait inference-actor links in memory. Investigating these possibilities for detecting manifest reference awaits future research.

IMPLICATIONS FOR MODELS OF PERSON MEMORY

Newman and Uleman (in press) discussed some of the implications of spontaneous trait inferences for existing models of person memory. The model developed by Carlston and Skowronski (1986) seems most useful for representing the present findings. In their model, the actor (identity), the behavior, and the trait inference are each represented as separate nodes in a cognitive structure. These nodes can be linked in a spreading activation network, and the links can vary in strength. Links are strengthened with use, and stronger links transmit activation between nodes more readily.

Our results suggest that incidental comprehension of a behavior (Experiment 2 above; Lupfer et al., 1990; Uleman et al., 1992; Winter et al., 1985) produces spontaneous trait inferences, that is, activates trait concepts that are based on and linked to the behavior. If the behavior is accompanied by a photo of the actor (or perhaps any other visual representation of the actor, as in face-to-face encounters), this facilitates other elaborations of the behavior that aid subsequent noncued recall of the behavior.

If subjects also have a goal that requires active elaboration of the stimulus (e.g., memorization or visualization as in Experiment 1 or 3), making the actor visually vivid strengthens the spontaneous trait to behavior link, but it does not necessarily create or affect links with the actor (i.e., the actor’s name in the present case). If this goal also promotes integrative elaboration (e.g., visualization in Experiment 3), it may strengthen the behavior-actor link without establishing the direct trait-actor link. And finally, if subjects have a goal that requires a direct trait-actor link (e.g., “form an impression in trait terms,” Uleman & Moskowitz, 1993, Experiment 6), that direct link will be established. But this direct trait-actor link is the most difficult of the three to establish.

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