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Causal Trait Theories: A New Form of Person Knowledge That Explains Egocentric Pattern Projection

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Representations of the self and others include not only piecemeal traits but also *causal trait theories*—explanations for why a person's standing on 1 trait causes or is caused by standings on other traits (Studies 1a–1c). These causal theories help resolve the puzzle of *egocentric pattern projection*—the tendency for people to assume that traits correlate in the population in the same way they align in the self. Causal trait theories—created to explain trait co-occurrence in a single person—are exported to guide one's implicit personality theories about people in general (Study 2). Pattern projection was found to be largely egocentric (i.e., more strong guided by self- than by social perceptions) for 2 reasons. First, causal trait theories are more numerous for the self. When participants were prompted to generate causal trait theories about someone else, they pattern projected more from that person (Study 3). Second, causal trait theories about the self are more likely to draw on behavioral information from multiple contexts instead of merely seeking to explain why 2 traits co-occur in a single context. Causal trait theories based on trait-relevant behaviors from different contexts, instead of trait co-occurrence within a single context, produce more pattern projection (Study 4). Implications for self and social cognition are discussed.

AQ: 1 *Keywords:* pattern projection, self, causal thinking, implicit personality theories, egocentrism

A person's perspective on his or her social world is typically framed by the self. Whether in taking another's perspective, predicting the opinions of others, or evaluating people one encounters, the self's own perspective (Epley, Keysar, Van Boven, & Gilovich, 2004; Epley, Morewedge, & Keysar, 2004), characteristics (Dunning, Meyerowitz, & Holzberg, 1989), and standing (Dunning & Cohen, 1992; Dunning & Hayes, 1996) influence such judgments. This egocentrism exists, in part, to maintain a person's sense of self-worth (e.g., Beauregard & Dunning, 1998), but it also permeates social views for other reasons. The self's own egocentric perspective is effortlessly brought to mind, and adjusting away AQ: 2 from it is effortful (Epley, Keysar et al., 2004). Further, in a social environment that is sparse on information, relying on self-knowledge may be a reasonable heuristic for understanding others (Dawes, 1989).

In this article, we seek to explain a recently documented means by which self-perception colors social perception, egocentric pattern projection (Critcher & Dunning, 2009). To do so, it will be necessary to offer and test a new account of why our understanding of others is contaminated by our understanding of ourselves. We posit a new type of person knowledge—one that goes beyond mere facts about a person (e.g., "I am health conscious and protective") to incorporate theories of why one aspect gives rise to or causes another (e.g., "My being protective leads me to be health conscious because . . ."). Ultimately, we argue that as a byproduct of trying to make sense of themselves, people end up coloring their impressions of others.

Egocentric Pattern Projection

In displaying *egocentric pattern projection*, people seem to use how two traits relate in the self to infer whether the two traits are positively or negatively correlated in other people. For example, if Jens sees himself as egalitarian and emotional, Jens will expect egalitarian people to be emotional and nonegalitarians to be less so. If Jens, instead, sees himself as egalitarian and not very emotional, he will assume that egalitarians will be unemotional but that nonegalitarians will be more emotive.

Across five studies, Critcher and Dunning (2009) provided consistent support for this pattern of aligning traits in others as one does in the self, showing that people's *implicit personality theories* (IPTs)-—beliefs about how personality traits tend to be configured AQ: 3 in people in general—tended to recapitulate the way traits were patterned in the self. Critcher and Dunning also distinguished this type of projection from its simpler cousin, *attributive projection*, in which people merely assume that individual traits they possess are more common in other people (Goldings, 1954; Holmes, 1981; Judd, Kenny, & Krosnick, 1983; Katz & Allport, 1931; Krueger & Stanke, 2001; Ross, Greene, & House, 1977). For example, with

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attributive projection, an egalitarian and emotional Jens would presume that other people are commonly emotional and egalitarian than he would if he did not possess those traits, but he would not draw inferences about the relationship between the two traits—that is, whether they wax and wane in others in tandem.

Critcher and Dunning (2009) additionally showed that the self played a causal role in pattern projection. When a (fictitious) personality inventory informed participants they were front brained and V dominant as opposed to back brained and Z dominant, participants assumed the two traits were correlated in a way consistent with the patterns observed in the self. Participants concluded that other people tended to be either front brained and V dominant or back brained and Z dominant. However, when given someone else's personality feedback, there was no similar jump to assume a correlation between brain type and variation of dominance.

Causal Trait Theories as the Missing Link

Critcher and Dunning (2009) documented pattern projection as a novel phenomenon but offered no empirical data as to why it arose or why it was egocentric. The present article seeks to fill this void by focusing on a new type of person knowledge, *causal trait theories*. Psychologists have long appreciated that when we understand a person, we know more than a mere list of trait descriptors (McAdams, 1985, 2001). As we come to know someone better, we progress from simple trait ascriptions to a better understanding of their personal strivings and motivations to, ultimately, developing a coherent narrative that achieves coherence, meaning, and purpose by weaving together events in the person's past, present, and anticipated future (Adler & McAdams, 2007; McAdams, 1995; Pals, 2006).

We agree that person representations are richer than mere traits, but we emphasize that even trait knowledge can take a more sophisticated form than a simple listing about a person's standing on various characteristics. Consider how a research participant studied by Park (1986) described another: "She is wealthy and egotistical, which makes for great fashion sense and good looks." This statement not only describes four piecemeal features of the social target, but offers a causal theory about how they relate: [(wealthy + egotistical) → (fashionable + attractive)]. This suggests that impressions not only contain listings of traits but also theories about how such attributes are causally related (Murphy & Medin, 1985).

The idea of causal trait theories has origins in Asch (1946), who noted that impressions of others—based on a list of traits—are different from the mere "sum" of those traits. In this sense, he recognized that traits in others are not interpreted in isolation but have implications for how other traits in a person should be interpreted or inferred. Thus, the calmness displayed by a warm person is qualitatively distinct from the calmness displayed by a cold person. Asch also focused on the importance of the order in which another's traits are learned, finding that earlier learned information constrains the way later learned information is understood.

Despite our different empirical focus, our interest in causal trait theories is foreshadowed in Asch's (1946) theoretical approach, in which he argued that people "try to get at the root of personality", that this means "the traits are perceived in relation to each other," and that such impressions comment on "processes between the traits each of which has a cognitive content" (p. 259). Whereas Asch used these ideas to justify why trait-based understandings cannot be studied in isolation, we draw on these ideas as pointing toward an important type of perception in its own right. That is, causal trait theories reflect explanations of how traits are influencing one another—the "processes between the traits." Although previous research has not set out to document causal trait theories directly, previous work has found that people have little difficulty generating ad hoc theories on demand (McNorgan, Kotack, Meehan, & McRae, 2007), even about seemingly contradictory evidence (Asch & Zukier, 1984). This gave us confidence that causal trait theories might be a pervasive but overlooked aspect of person representations.

How might causal trait theories help to explain pattern projection? Historically, there has been debate about whether IPTs are represented as mere correlations or associations among traits, as a multidimensional factor space onto which trait relationships can be mapped, or as "person types" (Anderson & Sedikides, 1991; Kim & Rosenberg, 1980; Rosenberg, 1976). We instead propose that IPTs are, in fact, theories—that is, rich explanations that go beyond mere correlation coefficients, factor loadings, or trait clusters (see also Sedikides & Anderson, 1994). As such, they contain a rich representation of how traits are causally related to each other. This assumption is consistent with recent empirically supported theorizing that people learn diagnostic relationships between features (i.e., whether the presence of X signals the presence of Y) by determining whether the evidence is consistent with a causal connection between the two (Meder, Mayrhofer, & Waldmann, 2014).

Research in cognitive psychology has uncovered the important role of explanatory or causal theories in perceiving correlations (Chapman & Chapman, 1967; Kunda, Miller, & Claire, 1990; McNorgan et al., 2007; Murphy & Wisniewski, 1989). Ahn, Marsh, Luhmann, and Lee (2002) illustrated this principle by showing that people are often unaware of actual, observable correlations when these correlations are difficult to explain. For example, most people are aware of the correlation between how close to water a bird lives and the probability that fish is part of a bird's diet (Ahn et al., 2002). In contrast, far fewer people realize that among shirts, there is a correlation between the presence of buttons and the length of sleeves. The former correlation lends itself to a simple causal narrative (e.g., "If a bird wants to eat fish, it behooves it to live near the ocean"), whereas there is no obvious causal theory to explain the latter (positive) correlation.

Ahn et al. (2002) noted that their research left open the question of whether "people explicitly notice correlations because they can explain them, or people impose explanations after they explicitly notice correlations" (p. 115). Our account of pattern projection proposes a mix of these two ideas. We suggest that instead of looking across exemplars in a category and trying to develop a theory of why certain characteristics would co-occur with others, people will also look to a single exemplar—usually, but not always, the self—and develop a theory about why certain characteristics (e.g., traits) co-occur in that sample of one. Supportive of this idea, people seem quite comfortable and ready to develop causal theories on the basis of one-shot learning, even when it would seem much more reasonable to remain agnostic until observing a broader array of data (Chater & Oaksford, 2005; Keil,

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2006). In addition, people generalize conclusions they draw about a single exemplar (e.g., a minority group member) to other members of the category (Risen, Gilovich, & Dunning, 2007; see also López, Gelman, Guthiel, & Smith, 1992).

Of course, people can have causal trait theories about any person—either themselves or someone else. But Critcher and Dunning (2009) found that pattern projection is egocentric—that is, stronger for patterns of traits in the self than for patterns of traits in well-known others. There are two independent ways that our account could explain such egocentrism. We test both possibilities.

The Quantity Hypothesis

A first possibility, the *quantity hypothesis*, is that people are more likely to generate causal trait theories to understand the self as opposed to someone else. If pattern projection emerges as a byproduct of generating causal trait theories to explain a single person, then people should pattern project more from targets about which they have generated more theories. This account does not see causal trait theories about the self as *special*, just more numerous. Thus, it predicts that people should pattern project from others as well when they have generated causal trait theories to explain them.

Of course, it would be naïve to predict that people never engage in similar theorizing about others, but we contend that such theories may be narrower in scope and more simplistic in structure. A number of previous findings support this possibility. Although people compose "person models" to explain others, these models tend to be structured around a central trait, with other information linked to this core concept (Park, DeKay, & Kraus, 1994). This leaves room only for causal theories that include the core concept. And even when representations of others include many traits, factor analyses indicate that representations of others are organized in a more simplistic and redundant manner than are understandings of the self (Beer & Watson, 2008; Borkenau & Liebler, 1994). The structure of other representations is more likely to follow a simple "evaluative narrative" (e.g., "She's a jerk") that does not necessitate a rich causal structure (Hampson, 1998). In total, self-knowledge is more nuanced, comprehensive, and complex. Causal trait theories may provide the glue to unify this disparate self-knowledge.

The Breadth Hypothesis

A second possibility, the *breadth hypothesis*, is that causal trait theories generated to explain the self are different in the breadth of their origin than theories about others. Causal trait theories can originate from people seeking to explain why two abstract qualities or traits exist within the same person by drawing on information from *multiple contexts* (e.g., "Does the fact that I am so conscientious, like when I'm at work, explain why I am often so quiet, like when I'm at home?"). Also, causal trait theories can originate from people seeking to explain why a person behaves as he or she does in a *single context* (e.g., "Was Mary so attentive at the party because she was feeling not very confident about her cooking?") We suggest that when causal trait theories take the former form—that is, draw on information from multiple contexts—they are more likely to be pattern projected. After all, these are theories about personality-unifying explanations of why one person may display different behaviors in different contexts. In contrast, theories of the latter variety are explanations of behavior in a context, meaning they should not be as easily exported to become general theories of human personality.

If causal trait theories that describe the self are more likely to be *multiple-context* theories than are causal trait theories about others, then this could be a second source of egocentrism in pattern projection. Although ultimately this is an empirical question (which we tackle), there are a few reasons to think this would be true. The self is, tautologically, with itself in more contexts than it is with others. As such, the self has more cross-context information to drawn on as it reflects on itself. Further, the self has direct access to its own intentions but not to those of others. This means that in any single context, there will be more of a demand to make sense of someone else's co-occurring behaviors instead of one's own. We test these assumptions and whether they account for the egocentric nature of pattern projection.

Overview of the Studies

In sum, we propose that causal trait theories are an overlooked aspect of person knowledge and a key construct that will help to resolve the lingering mystery of why egocentric pattern projection emerges. Studies 1a–1c introduced three distinct methods to test for the prevalence of causal trait theories, ultimately assessing whether such theories are more numerous and accessible about the self than about others. Study 2 tested whether causal trait theories explain egocentric pattern projection. Studies 3 and 4 provided experimental tests of the quantity and breadth hypotheses by testing whether people begin to pattern project from others once prompted to think about others in the style, and with the type of information, that characterizes the way people tend to think about the self. Study 3, in a test of the quantity hypothesis, tested whether prompting people to generate causal trait theories (vs. memorize trait information) about others encourages pattern projection from them (as the quantity hypothesis would predict). Study 4, in a test of the breadth hypothesis, tested whether participants who received behavioral information about yoked participants that spanned multiple contexts (thereby matching the informational origin of causal trait theories for the self), versus information that came from a single context, generated causal trait theories that encouraged relatively more pattern projection from those yoked others.

Study 1a

Study 1a was designed to examine the prediction that people hold a greater number of causal trait theories for the self than for others. Participants were asked to create a trait theory map, either of themselves or their freshman-year roommate. We chose roommates as the comparison other for two reasons: (a) roommates have been used as a "familiar other" in prior research (Prentice, 1990), and (b) Critcher and Dunning (2009) repeatedly established that college students pattern project more from themselves than from their freshman-year roommate.

Method

Participants and design. Two hundred and eight undergraduates at Cornell University participated in exchange for $5 or extra

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course credit. Participants were randomly assigned to draw a causal trait theory map to describe themselves (*self* condition) or their freshman-year roommate (*other* condition).

Procedure. All participants began by rating themselves or their freshman-year roommates[1] on 16 personality traits: *bashful*, *considerate*, *cunning*, *dependent*, *extravagant*, *generous*, *happy-go-lucky*, *idealistic*, *opportunistic*, *persistent*, *prideful*, *prudent*, *reserved*, *resigned*, *skeptical*, and *wordy*. We included this step because we did not want differences between causal trait theory maps to emerge only because trait knowledge about the self was more accessible.

Participants were then given 16 index cards, each representing one of the 16 traits. All were then told that people sometimes construct theories to explain people, explanations that link together different aspects of a personality in a causal story. To facilitate thinking about causal trait theories, participants were first asked to look through the cards and form clusters of traits for which a theory could be offered to explain why all those traits coexisted within one person. The instructions explained that each cluster had to have at least two traits in it and that participants need not use all 16 cards. Because each trait appeared on exactly one card, the same trait could not appear in multiple clusters. Although there are several interesting, measurable features of these clusters (e.g., how many traits are part of the clusters created, how many "theory clusters" participants created altogether), this step was largely a prelude to the next stage, in which we had people draw out more complete causal theory maps.

In the next task, participants were told that they would draw a more complete causal trait map, indicating the ways in which specific personality traits influenced other traits, or how two traits were influenced by some third-variable aspect of personality. Two examples were offered to illustrate the difference between these types of theories. One was a direct causal link: for example, "In me, I am creative *because* I am not very extroverted." Participants represented such a direct causal link by drawing a directional arrow from one trait to another. The other was a third-variable causal link: for example, "My desire to grow up to be a successful artist leads me to further develop my creative abilities and to spend a lot of time on solitary activities that are not very extroverted." Participants represented a third-variable link by connecting two traits with a line and then drawing an arrow that pointed at the line (see Figure 1). Our primary motivation in assessing links of both types (direct or third-variable) was to understand whether one type was obviously more prevalent than the other to thereby guide our focus in future studies.

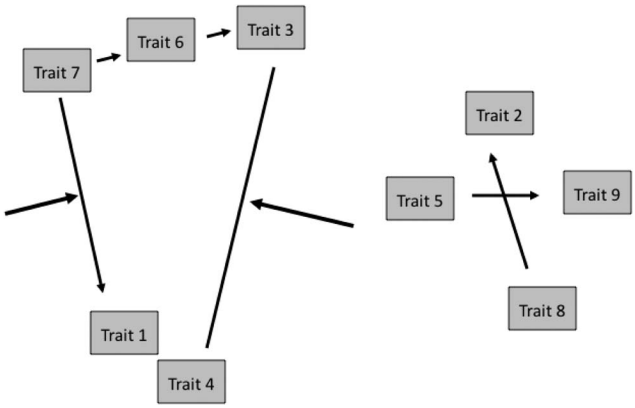

Figure 1. Example causal trait theory map from Study 1a. This map depicts five directional theories and two third-variable theories. Note that two traits can be connected by theories of both types (e.g., Traits 1 and 7).

Results and Discussion

By every metric, the trait theory maps of the self were more comprehensive and contained more causal connection than those of roommates. As shown in Table 1, when describing the self, participants created a larger number of clusters than they did when describing an other, $t(202) = 2.22$, $p = .03$, $d = 0.31$. Further, they included more of the 16 traits in their own clusters than in those describing someone else, $t(182.26) = 2.81$, $p = .01$, $d = 0.40$.[2] In addition, participants saw more direct causal relationships in the self than they did in someone else, $t(206) = 2.17$, $p = .03$, $d = 0.30$. Although third-variable theories were relatively rare in characterizing either target, such theories were also more numerous in maps of the self than those of the roommate, $t(195.17) = 2.38$, $p = .02$, $d = 0.33$.

It is notable the extent to which directional theories were much more numerous than third-variable theories in the theories participants had about the self, paired $t(105) = 20.39$, $p < .001$, $d = 1.98$, and about the other, paired $t(101) = 22.32$, $p < .001$, $d = 2.21$. As such, we only measured directional theories in future studies, given that the rarity of third-variable theories made them poor candidates for explaining pattern projection. Furthermore, we see Study 1a as an especially conservative test of our hypotheses. That is, even if participants did not already have well-formed causal trait theories about the other, they may have tried to create them in the moment. Study 1b explored this possibility further.

Study 1b

Did participants' causal trait theory maps reflect preexisting representations, or did they merely reflect people's constructions once they were prompted to describe them? Study 1b addressed this question by assessing whether causal trait theories about the self are not only more numerous but more accessible in memory. That is, if such theories already exist, they should be more rapidly reportable (Park, 1986; Prentice, 1990). If instead participants in Study 1a had more theories about the self because they took more time trying to construct them in the moment, then it would take longer for participants to report this information about the self than about someone else.

Participants in Study 1b were asked 55 yes–no questions about whether they had a causal trait theory to explain why two traits were related in the self. They also answered the same questions concerning their causal trait narratives of their freshman-year

[1] If participants had more than one freshman-year roommate, they were asked to choose the roommate whose bed was closest to their own. If participants did not have a roommate, they were asked to consider the person to whom they lived closest.

[2] When independent-sample *t* tests include a noninteger degree of freedom, this reflects a correction due to a homoscedasticity violation. The degrees of freedom in the multilevel models were calculated using the Satterthwaite approximation.

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Table 1
Features of Causal Trait Theory Maps Describing the Self or an Other (Study 1a)

Attribute	Self	Other
Clusters	4.65 (0.99)	4.31 (1.21)
Traits used	13.40 (1.89)	12.52 (2.55)
Directional causal theories	10.89 (5.03)	9.53 (3.88)
Third-variable causal theories	1.27 (1.58)	0.81 (1.19)

Note. Each mean is followed by the corresponding standard deviation in parentheses.

roommate. We had two central predictions. First, we expected that even with this modified measurement technique, people would again report more causal trait theories for the self than for an other. Second, we expected that these causal trait theories for the self would be more accessible than the theories for the roommate. That is, people should be faster to indicate whether they have a theory to explain the self than a theory to explain the roommate.

Method

Participants. Participants were 41 undergraduates from Cornell University. In exchange for their participation, participants received $5 or course credit.

Procedure. As in Study 1a, participants began by rating themselves and their freshman-year roommates, with order counterbalanced across participants, on 11 personality traits: *bashful*, *considerate*, *dependable*, *happy-go-lucky*, *idealistic*, *persistent*, *prideful*, *reserved*, *resigned*, *skeptical*, and *wordy*. Next, participants answered 55 questions about their causal trait theories for the self as well as 55 about the causal trait theories for their freshman-year roommate. Each question took this form: "Does how SKEPTICAL you are [your roommate is] cause how PRIDEFUL you are [your roommate is]?" For each trait pair, which trait was the possible antecedent versus consequent trait (in this case, skeptical vs. prideful, respectively) was held constant. Fn3 Responses were coded dichotomously (*yes* = 1, *no* = 0).[3] The time participants took to respond—from the moment the question appeared onscreen until the point that the participant depressed one of the two response keys—was recorded, in milliseconds. The order of responding about the self versus the roommate was Fn4 counterbalanced across participants.[4]

Results and Discussion

We first tested whether participants reported more causal trait theories for the self than for their roommates. We submitted the total number of *yes* responses to a mixed-model analysis of variance (ANOVA), with the counterbalancing order variable as a between-subjects variable and target (self or other) as a within-subject variable. As predicted, participants' self-narratives were more numerous ($M = 28.30$, $SE = 1.42$) than their causal narratives about their roommates ($M = 24.50$, $SE = 1.44$), $F(1, 39) = 13.93$, $p < .001$, $\eta_p^2 = .26$. Also, participants more quickly answered causal questions about themselves ($M = 4.02$ s, $SE = 0.24$ s) than about their freshman-year roommates, ($M = 4.36$ s, $SE = 0.29$ s), $F(1, 39) = 6.43$, $p = .02$, $\eta_p^2 = .14$. This accessibility difference was equally strong regardless of whether participants were indicating that a particular trait pair was or was not in their causal narrative for their roommate or for themselves ($F < 1$).

These accessibility findings are particularly helpful in that they help to speak against an artifactual account of Study 1a that participants were merely willing to spend more time, in the moment, trying to generate or "fish for" causal trait theories about the self than about someone else. If so, participants would have been slower, not faster, to report on causal trait theories about the self.

Study 1c

Study 1c introduced a third, more conservative method to measure the presence of causal trait theories. Participants were given a trait and then asked whether they could generate another trait in themselves (or their freshman-year roommate) that explained their (or their roommate's) standing on the first trait. If they indicated that they could, they had to list what that causal trait was. In this way, participants were more accountable when they indicated that they had a causal trait theory: Research participants tend to report less information in their self-representations when they have to generate the content themselves as opposed to merely indicate whether certain knowledge is in these representations (Dunkel & Anthis, 2001). Thus, the present method would give us more confidence that self–other differences reflected differences in person representations as opposed to differences in a willingness to endorse that items are part of one's self-representation.

As a secondary goal, we tested whether participants reported having causal trait theories in a circumstance that should, logically, predict their presence: whether the person (i.e., the self or the other) was seen as highly consistent (as opposed to variable) on the trait across situations. People should be more likely to explain a consistent trait by appealing to something about the person (i.e., by forming a causal trait theory); in response to cross-context variability, situational explanations may become more likely. If causal trait theories were more numerous for consistent traits, we would have further confidence that the causal trait theory measure was valid and did not merely elicit more self-theories because of a bias toward indicating that one's self-knowledge is more thorough than it actually is.

Method

Participants. Participants were 73 undergraduates from the University of California, Berkeley. In exchange for their participation, participants received course credit.

Procedure. Participants saw the 11 personality traits used in Study 1b. As before, participants rated themselves and their room-

[3] We used a smaller sample size in Studies 1b and 1c (compared with Study 1a) because each participant reported causal trait theories for both the self and the roommate (instead of one or the other). This increased our power, because it allowed us to control for individual differences in the tendency to report having causal trait theories. Highlighting the gains that the fully within-subject design offered, we observed a strong correlation between how many causal trait theories participants reported having about the self and their roommate: $r(39) = .75$, $p < .001$ (Study 1b), and $r(71) = .76$, $p < .001$ (Study 1c).

[4] There was no evidence of significant skew in the latencies to the self-theory ($z = 1.61$, $p = .11$) or the roommate-theory questions ($z = 1.45$, $p = .15$), so all analyses on the reaction times were performed on the untransformed means.

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mates on the traits. Next, they completed two measures in a counterbalanced order:

Causal trait theories. Participants were told that they would be asked to indicate their theories of why they (and their freshman-year roommates) had certain traits. We explained that they may have a theory that "how much you have or display . . . a given trait is caused or influenced by some other trait you possess." As an example, we described Mary, a woman whose *unkind* nature might be explained by her being *ambitious*: "Perhaps Mary (rightly or wrongly) believes she does not need other people to get ahead, so her ambitiousness leads her to be ruthlessly unkind to others." For each trait, participants were to indicate whether another trait in themselves (or their roommate) "influences or causes how much you have [your freshman-year roommate has] the trait." We then explained that, "If you cannot think of such a trait, type 'none' in the blank." The traits appeared in a random order.

Cross-situational consistency. We explained to participants the difference between showing consistency or variability in how much one displays a trait. An example described that a person might be moderately jittery from situation to situation (*consistent*) or might be quite jittery in some situations but not at all jittery in others (*variable*). For each trait, participants indicated (dichotomously) whether it existed fairly consistently or with variability in the self (or in the roommate).

Results and Discussion

Given our interest in multiple levels of analysis, we used multilevel modeling. We tested whether participants were more likely to indicate a causal trait when considering why the self possesses traits than when considering why their freshman-year roommate does. We began with one Level 1 variable, *target* (+1 = self, −1 = roommate), nested within participant. We also defined *order*, a Level 2 variable that differentiated participants who indicated their causal trait theories about the self or the roommate first. The Target × Order interaction term accounted for variance that was merely attributable to the order in which the target measures were completed. Finally, we included a random effect of *trait*, because some traits prompted more theories than did others. This analysis revealed that participants were more likely to identify causal traits for the self (73.74%) than for their freshman-year roommate (67.02%), $t(71) = 3.19$, $p = .002$, semipartial $R^2 = .13$. Thus, three studies using different measures with different strengths converged on the conclusion that people have more causal trait theories to explain themselves than to explain others.

Supporting our secondary goal, people were more likely to have a causal trait theory to explain consistent traits (74.44%) than variable traits (64.28%), $t(71.43) = 4.34$, $p < .001$, semipartial $R^2 = .21$. This relationship was true for theories about the self and one's roommate alike ($t < 1$).[5] Thus, two aspects of this study—the fact that participants had to identify the causally antecedent trait as well as the presence of the systematic negative relationship between the presence of a causal trait theory and the reported stability of the trait in the target—lend support to the validity of the causal trait theory measure.

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Study 2

Having provided convergent evidence that people hold causal trait theories, especially for the self, we more directly examined their role in explaining egocentric pattern projection. Participants provided trait ratings about their own and their freshman-year roommate's personalities and provided judgments about how pairs of personality traits are correlated in people in general (i.e., IPTs). We expected to replicate Critcher and Dunning (2009) by uncovering evidence of egocentric pattern projection. That is, we expected that IPTs would relate to how traits were patterned in the self (pattern projection) but less so to how traits were patterned in the roommate (egocentric).

Participants also indicated whether they had a causal trait theory to explain why each of the 55 trait pairs was related in the self or in the roommate, using a measure similar to that used in Study 1b. If causal trait theories underlie pattern projection, then people should show stronger pattern projection for those trait pairs whose co-occurrence is explained with a causal trait theory. If the greater number of causal trait theories to explain the self versus the roommate accounts, at least in part, for pattern projection's egocentrism (the quantity hypothesis), then we should expect causal trait theories to be more numerous in the self (as in Studies 1a–1c) but also for the theory's presence to moderate the degree of pattern projection from both the self and the roommate. If it is not merely the number but the nature of causal trait theories for the self (vs. someone else) that explains the egocentric nature of pattern projection (consistent with, but not necessarily supportive of, the breadth hypothesis), then the presence of a causal trait theory for the self should predict more pattern projection than the presence of a causal trait theory for an other.

Method

Participants and design. Participants were 213 undergraduates at the University of California, Berkeley, who participated in exchange for course credit or $15.

Procedure. All participants provided trait judgments of themselves and their freshman-year roommates, indicated whether they had causal trait theories to explain trait co-occurrences in the self and in the roommate, and they made judgments from which their IPTs could be induced. Participants completed their trait judgments and IPTs in a counterbalanced order. Either 30 min before or 30 min after completing these, participants indicated whether they had a causal trait theory to explain how each of 55 trait pairs co-occurred in the self and in the roommate. Self and roommate judgments were also made in a counterbalanced order:

Causal trait theories. Participants answered a total of 110 dichotomous questions: 55 about the self and 55 about their freshman-year roommate. Each question was of the same form: "Does how RESIGNED you are [your freshman-year roommate

[5] Note that because, if anything, trait consistency was seen to be lower in the self (38.27%) than in the roommate (46.21%), $t(71) = 3.25$, $p = .002$, semipartial $R^2 = .13$, trait consistency likely suppresses, but certainly does not explain, the self's advantage over the freshman-year roommate in number of causal trait theories (Monson, Tanke, & Lund, 1980).

AQ:10

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is] cause how CONSIDERATE you are [your roommate is]?" Participants responded by indicating yes (*Y*) or no (*N*).

Trait judgments. Participants indicated their own standing and their freshman-year roommate's standing, in a counterbalanced order, on each of the 11 traits. The 11-point scale was anchored at 1 (*not at all*) and 11 (*extremely*).

IPTs. Participants answered one question for each of the 55 trait pairs: "If all you knew about a person was that he or she was more _____ than average, it is what percent likely that s/he would also be more _____ than average?" To make sure people understood the logic of the scale, we noted that all responses should be between 0% and 100%. To establish 50% as a neutral midpoint, the experimenter noted that "If knowing someone is more [the first trait] than average gives you no information about whether the person is more [the second trait] than average, you would indicate 50%." The order in which the IPT was measured always matched the order in which the causal trait theory was measured. That is, the example causal trait theory measure provided earlier would be paired with an IPT measure asking how likely it was that a person who is more resigned than average would also be more considerate than average.

Results

First, we attempted to replicate our earlier findings that people have more causal trait theories in understanding the self than someone else. Second, we attempted to replicate Critcher and Dunning's (2009) finding that people pattern project more from the self than from someone else. Third, we tested whether the greater number of theories people have about the self explains why people pattern project more from the self (the quantity hypothesis). Fourth, we tested whether theories people have to explain the self are more likely to prompt pattern projection than theories people have to explain someone else (consistent with the breadth hypothesis).

Do people have more causal trait theories about the self? We submitted participants' responses to the causal trait theory measure to a 2 (target: self or roommate) × 55 (trait pair) mixed-model ANOVA. Conceptually replicating the earlier results, participants had more causal trait theories to explain themselves ($M = 26.7$, $SE = 0.7$) than to explain their freshman-year roommate ($M = 25.0$, $SE = 0.7$), $F(1, 211) = 14.37$, $p < .001$, $\eta_p^2 = .06$.

Do people pattern project more from the self than from their roommate? Next, we attempted to replicate Critcher and Dunning's (2009) findings that people's IPTs recapitulate patterns observed in the self more than someone else. First, we defined two Level 1 variables that were centered before being entered into all analyses: *self-difference* and *roommate-difference*. For any given pair of traits *i* and *j*, the variables reflected the absolute value of the difference between the trait judgments for the self or the roommate on those two traits, respectively. Pattern projection is observed when the degree to which two traits co-occur similarly [dissimilarly] in a target predicts beliefs that the two traits correlate positively [negatively] in the general population.[6] Fn6

We constructed a random-slope, random-intercept model predicting participants' IPTs in which self-difference and roommate-difference were nested within each trait pair. In this way, we could explain whether individual differences in IPTs for a specific trait pair could be traced to differences in people's perceptions of their own (and their freshman-year roommate's) personality. The random intercept essentially controls for differences between trait pairs in how much they are perceived as correlated, but we also included *participant* as a random effect to control for individual variability in seeing traits, in general, as more positively or negatively correlated.

There was evidence of pattern projection both from the self and from the roommate. That is, the greater the difference in any two traits in the self (B = 1.12, $SE = 0.10$) or in the freshman-year roommate (B = 0.69, $SE = 0.10$), the more people held the IPT that the two traits were negatively correlated in people in general (ts = 11.02 and 6.62, ps < .001, respectively). To test whether pattern projection was egocentric, we ran an additional model that compared the relative influence of the two predictors in predicting IPTs—that is, whether the two betas just reported were significantly different. They were, $t(19{,}816.84) = 2.75$, $p = .01$, semipartial $R^2 = .0004$. In short, people pattern projected more from themselves than they did from another sample of one—that is, their roommate.

Do causal trait theories explain egocentric pattern projection? We extended our last model by first introducing two more Level 1 variables: *self-theory* and *roommate-theory*. Each variable was coded +1 if, for that particular trait pair for that particular participant, the participant indicated having a causal trait theory to explain the self (self-theory) or their freshman-year roommate (roommate-theory). The same variables were coded −1 if participants reported not having such a theory. We tested whether causal trait theories encourage pattern projection from both the self and the roommate (the quantity hypothesis). We then tested whether causal trait theories were more likely to encourage pattern projection from the self than from the roommate (consistent with the breadth hypothesis). Note that these hypotheses are not mutually exclusive.

Do people pattern project trait relationships for which they have causal trait theories? Supporting the quantity hypothesis that causal trait theories give rise to pattern projection, both the Self-Difference × Self-Theory and Roommate-Difference × Roommate-Theory interaction terms were significant (see Figure 2). More specifically, people pattern projected from the self F2 more for trait pairs for which they had causal trait theories to explain the trait co-occurrence in the self (B = 0.38, $SE = 0.08$), $t(7{,}209.12) = 4.54$, $p < .001$, semipartial $R^2 = .0028$. Turning to simple effects, when participants had a causal trait theory to explain why two traits co-occurred as they did in the self, they pattern projected strongly (B = 1.43, $SE = 0.16$), $t(10{,}999.16) = 8.85$, $p < .001$, semipartial $R^2 = .0071$. But when participants failed to have a causal trait theory to explain the co-occurrence in the self, pattern projection was signifi-

[6] Pattern projection is reflected by negative betas, but for ease of interpretation, all such betas, in this and all studies, have been reversed so that positive values reflect pattern projection.

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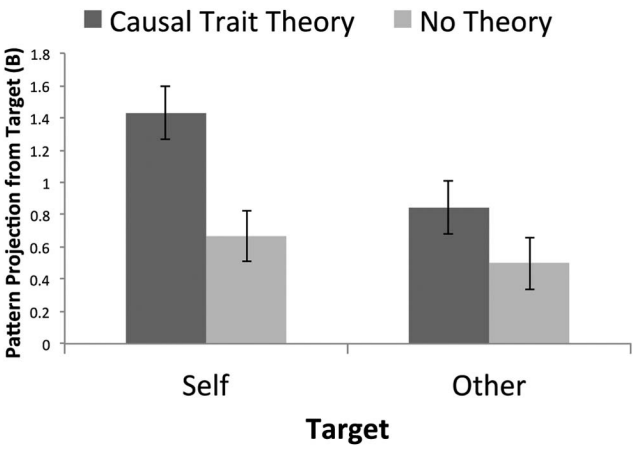

Figure 2. Pattern projection from a target (self or other) for trait pairs for which participants did or did not report having a causal trait theory about that target (Study 2). The significant difference between bars within each cluster reflects the Self-Difference × Self-Theory and Roommate-Difference × Roommate-Theory interaction terms—that is, support for the quantity hypothesis. The significant difference between the two darker (causal trait theory) bars is consistent with the breadth hypothesis. The error bars reflect ±1 standard error of the estimate of the beta that corresponds to pattern projection. Because implicit personality theories were measured somewhat differently in Study 2 than they were in Studies 3 and 4, it is not meaningful to compare betas across those studies.

cantly weaker (B = 0.67, *SE* = 0.16), $t(22{,}912.47) = 4.23$, $p < .001$, semipartial $R^2 = .0008$.[7] Fn7

Participants also pattern projected from their freshman-year roommate more for trait pairs for which they had causal trait theories to explain trait co-occurrence in the roommate (B = 0.17, *SE* = 0.08), $t(6{,}582.27) = 2.16$, $p = .03$, semipartial $R^2 = .0007$. That is, when participants had a causal trait theory to explain trait co-occurrence in the roommate, they pattern projected from this other (B = 0.85, *SE* = 0.17), $t(24{,}637.40) = 5.05$, $p < .001$, semipartial $R^2 = .0010$. But when participants did not hold such a causal trait theory, pattern projection from the roommate was weaker (B = 0.50, *SE* = 0.16), $t(35{,}895.44) = 3.14$, $p = .002$, semipartial $R^2 = .0003$, but still significant. The fact that pattern projection—even in the absence of causal trait theories—was still significant, both from the self and from the roommate, suggests that multiple mechanisms give rise to pattern projection.

Do causal trait theories about the self produce more pattern projection than do causal trait theories about another? We next tested whether there is something special—as the breadth hypothesis would predict—about the causal trait theories about the self that predict more pattern projection. We first tested whether the Self-Theory × Self-Difference interaction term was stronger than the Roommate-Theory × Roommate-Difference interaction term. The difference was marginally significant, $t(6{,}190.65) = 1.77$, $p = .08$, semipartial $R^2 = .0005$.

Stronger support for our account was found once we moved on to the planned comparisons. In particular, when participants had a causal trait theory to explain both the self and a roommate, they pattern projected more from the self, $t(13{,}354.13) = 2.56$, $p = .01$, semipartial $R^2 = .0005$. But in the absence of any causal trait theories, there was no greater pattern projection from the self than from the roommate ($t < 1$, semipartial $R^2 < .0001$). This latter finding shows that causal trait theories fully explain the *egocentric* nature of pattern projection.

Discussion

Study 2 supported our contention that causal trait theories play a crucial role in producing pattern projection and explaining its egocentric nature. First, people were more likely to pattern project from the self or from someone else when they had a causal trait theory to explain a given trait patterning in that person (consistent with the quantity hypothesis). But second, and consistent with the breadth hypothesis, when people had a causal trait theory to explain the self, that translated into significantly stronger pattern projection than did a causal trait theory to explain the roommate. In combination, this suggests that part, but not all, of the egocentric nature of pattern projection is explained by the greater number of causal trait theories people hold about the self than about someone else. However, an additional part must be explained by some feature of causal trait theories about the self, which are more likely to generalize to influence IPTs than are similar theories about the roommate.

In Studies 1a–1c, we were sensitive to the possibility that participants may not have had preexisting causal trait theories but may have been constructing them only once they were suggested by the measures themselves. Although we provided evidence that spoke against that possibility, we took advantage of our counterbalancing in Study 2 to address this question in an additional way. Recall that some participants indicated whether they had causal trait theories about the self and the roommate *before* stating their IPTs, whereas for other participants the order of these measures was reversed. If asking people to report on their causal trait theories caused people to create theories they did not already have, then we should see a stronger link between the presence of theories and pattern projection when the causal trait theory measure preceded the IPTs compared with when causal trait theories were measured later. Contradicting this possibility, the tendency for pattern projection to be stronger from trait pairs about which participants had a causal trait theory was not stronger still when causal trait theories were measured before IPTs. That is, there was no further moderation by the order manipulation in explaining when pattern projection emerged from the self (B = 0.02, *SE* =

[7] In another study (not reported here), we found that whether people pattern projected from a given trait pair depended on whether they had a directional causal theory (e.g., "Does how CONSIDERATE you are cause how WORDY you are?") to explain why the traits were related, $t(5{,}509.81) = 3.29$, $p = .001$, semipartial $R^2 = .0020$, but not on whether they had a third-variable theory (e.g., "Does another aspect of your personality [e.g., a goal you have or a trait you possess] help explain both how CONSIDERATE you are and how WORDY you are?") that explained the traits, $t(7{,}382.46) = -0.09$, *ns*. Thus, not only are third-variable theories not particularly numerous in person representations (Study 1a), they do not appear to play an important role in understanding pattern projection. We speculate that this comes from a difference in "exportability" of the two theories. A theory that explains why X causes or is caused by Y (a direct causal theory) can be applied relatively unconditionally. In contrast, a theory that both X and Y are influenced by Z (third-variable theory) is more straightforward to apply when one knows another's standing on Z. Regardless, this suggests that pattern projection emerges not merely from two traits being connected as part of a broader narrative but requires that traits be directly linked.

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0.08, $t < 1$) or from the roommate (B = 0.08, SE = 0.08), $t(10{,}365.02) = 1.03$, $p > .30$, semipartial $R^2 = .0001$. If the measures themselves were prompting the creation of causal trait theories, then IPTs should have been less tethered to causal trait theories when causal trait theories were measured at the end (when any newly created theories could no longer influence the IPTs).

One limitation of Study 2 is that the results are correlational. Is it possible that people observed trait patternings in the world, explained them, and then had causal trait theories to make sense of those same patternings in themselves and their roommate? This reverse-causality argument is made unlikely by Critcher and Dunning's (2009) experimental studies showing that self-perceptions lead to IPTs. Further, this alternative explanation cannot easily account for why causal trait theories more strongly predicted pattern projection for the self than for the roommate.

A final concern is whether there may be certain trait pairs—perhaps because they have semantic overlap (e.g., bashful and reserved)—that are more likely to co-occur in the self, more likely to be explained by causal trait theories, and also more likely to be perceived as correlated. This is essentially a third-variable concern. Two features of our design and analyses helped rule out this alternative. First, because all analyses looked at the influence of the self while controlling for the influence of the roommate, one would have to explain why a feature of a trait pair like semantic overlap would appear in one's self-ratings and self-theories but not in one's roommate-ratings and roommate-theories. Second, because all multilevel models were nested within trait pair (and thus explain variation between participants while holding the trait pair constant), this essentially prevented general differences among trait pairs from driving effects.

Study 3

Study 3 had the ability to provide *causal* support for the first proposed mechanism underlying egocentric pattern projection—that having a causal trait theory to explain why two traits relate in a person leads people to export that theory to explain people in general (the quantity hypothesis). In Study 3, we presented participants with trait information about three novel targets. Some participants constructed causal trait theories to explain why traits related as they were said to in those targets. Other participants processed the trait information about these targets in a more piecemeal fashion that did not involve theorizing. After processing the target information in one of the two ways, participants stated their IPTs.

We expected that participants who generated causal trait theories to explain a specific other would begin to pattern project from that person. Of course, our account does not predict that pattern projection emerges from the mere *attempt* to create a causal trait theory to explain someone else but, instead, from the successful creation of the theory. This predicts a more nuanced hypothesis that *only* to the extent that a participant reports success in generating a causal trait theory about the target should that attempt elevate pattern projection from that target.

Method

Participants and design. Participants were 405 undergraduates at Cornell University who completed the experiment in exchange for extra course credit. Participants were randomly assigned to one of four conditions in a 2 (processing task: causal theory or control) × 2 (target version) full-factorial design.

Materials and procedure. Participants were first informed that they would receive information about three different targets. This information would comprise four sentences, each conveying trait-relevant information. As shown in Table 2, each sentence was T2
of the form, "Person *X* is [very; very much NOT] *trait Y*." After each sentence appeared on the screen, 45 s elapsed before the next sentence would appear. Even after the next sentence had appeared, the prior sentences were still visible. During the 45-s period, participants were to engage in one of two processing tasks, depending on their condition.

Targets. We chose 12 traits that we had used in prior studies. All participants had indicated their own standing on each of the traits (all listed in Table 2) on a Web-based pretest completed at least 24 hr before coming to the lab. These ratings were made on 11-point scales anchored at 1(*not at all me*) and 11 (*completely me*). These traits were randomly grouped into three groups of four traits. The four traits in each group would form the basis for a description of a novel target. We then constructed two versions of each person by randomly determining, for each target, whether the target was described as "very much" having the trait or "not at all" (being the opposite of) the trait.[8] To minimize the likelihood that Fn8
two contrasting traits would be nonsensically paired within the same person (e.g., very bashful but not at all reserved), we added the constraint that the four traits used to describe a person had to be fairly uncorrelated. (We used trait ratings from past studies to confirm that the absolute value of each correlation was less than .20.)

The two versions of each of the three targets are described in Table 2. What is less important than the level of each trait in each target is how each pair of traits relates in each target. For example, even though Target 3's skepticism and prudence differ by version, the two traits are negatively correlated in each version and, thus, do not constitute a trait pair of interest. Across the three targets, 11 of the 18 observed trait relationships differed between the two targets. If participants are pattern projecting from a target, then they should infer more of a positive correlation between two traits when the traits relate similarly in the target ("very much"–"very much" or "not at all"–"not at all"), but more of a negative correlation when the traits exist dissimilarly in the target ("very much"–"not at all" or "not at all"–"very much").

Causal trait theory condition. The instructions in the causal theory condition prompted participants to generate a causal trait theory explaining how the traits all influenced each other to give rise to a single, coherent individual: "Your task will be to incorporate each new piece of information you learn into a coherent picture of the person. You want to try to link together individual

[8] We followed the precedent of Critcher and Dunning (2009) in saying that a person was "not at all" a trait instead of trying to find a word to characterize the opposite of a trait. This afforded three advantages. First, it facilitated our measurement of IPTs, for we could use a single trait label to refer to each trait dimension. Second, this permitted a more efficient presentation of materials, for we did not have to teach participants which traits they should assume to be the exact opposites of which traits. Third, we were not limited by having to lean only on traits that had clear opposites.

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Table 2
Both Versions of the Three Social Targets Presented in Study 3

Trait [Version A; Version B]
Target 1
Person 1 is [not at all; very] generous.
Person 1 is not at all cunning.
Person 1 is very resigned.
Person 1 is very dependent.
Target 2
Person 2 is [not at all; very] happy-go-lucky.
Person 2 is very bashful.
Person 2 is not at all prideful.
Person 2 is [not at all; very] idealistic.
Target 3
Person 3 is [very; not at all] skeptical.
Person 3 is [not at all; very] prudent.
Person 3 is very opportunistic.
Person 3 is very wordy.

Note. Trait information is listed in the order in which it was presented.

traits to understand how they influence or affect each other, why they fit together as they do in the same person."

We then provided an example causal trait theory that could explain why a person was both very extroverted and very creative. It was emphasized to participants that they should try to analyze and type for the full 45 s. Note that we gave plenty of time to participants to create these theories, because such theories are more content-rich than the simple relationship "Trait A causes Trait B." Instead, theories involve a fuller explanation about *why* such a relationship emerges.

Control condition. For the control task, it was important that participants still focus on information about the target but not on how or why the traits co-occurred in the target. Accordingly, control participants were asked to elaborate on what it meant for the target to possess each of his or her traits. Thus, when each new sentence appeared, instead of spending 45 s trying to generate theories to connect the newly presented trait to the other traits, the participant spent 45 s elaborating on what the trait meant: "For example, if you learned a person was 'very much extroverted,' you might type that the person is 'a sociable, affable kind of person, interested in socializing, not at all aloof or shy, warm, gregarious . . .'" It was emphasized that participants were to generate these descriptions only about the most recently presented piece of information. This was stressed so that participants would not think their task was to synthesize across the traits and describe what the person as a whole was like.

After participants completed the full 3-min processing task for each target, they were asked how difficult it was to successfully complete the processing task for that target by pressing 1 (*not at all difficult*), 2 (*a little difficult*), 3 (*somewhat difficult*), or 4 (*very difficult*). After seeing all three targets, participants stated their IPTs for all 18 possible trait pairs, even though only 11 of these trait pairs would allow us to assess whether participants were pattern projecting from the targets. We measured IPTs using Critcher and Dunning's (2009) three-judgment method—assessing p(trait 1), p(trait 2), and p(trait 1|trait 2). The IPT was derived using the following linear expression: p(trait 2) $\times$ [p(trait 1|trait 2) $-$ p(trait 1)]. Higher numbers reflected a greater perceived correlation.

At the end of the experiment, participants encountered a surprise recognition task. Participants were presented with the 12 traits that had been associated with the three targets. They had to indicate whether the target in question "very much" or "very much did NOT" have the trait. In this way, we could assess whether any tendency to pattern project differently by condition could actually be attributable to a superior explicit memory for the information about the target instead of the act of theorizing about the target.

Results and Discussion

We tested whether those assigned to generate a causal trait theory of someone else would then pattern project more from that person. First, we created a variable called *patterning.* This variable differentiated whether a specific pair of traits, as seen by a specific participant, was patterned in the target in a way that implied a positive correlation (+1: "very X"–"very Y" or "not at all X"–"not at all Y") or a negative correlation (−1: "very X"–"not at all Y" or "not at all X"–"very Y"). Thus, a positive effect of patterning on IPTs would reflect pattern projection. Second, we defined the variable *processing task*, which differentiated participants who were prompted to generate causal trait theories (+1) versus process the traits in a piecemeal fashion (−1). Third, given that previous research indicates that people tend to pattern project from the self, we used participants' pretest ratings of themselves to create absolute value difference scores for all relevant traits pairs (i.e., |self-rating on trait i − self-rating on trait j|).

We constructed a multilevel model to assess our main hypotheses. Patterning, processing task, (self-reported) difficulty (of the processing task), and the self-difference score were nested within trait pair in a random-slope, random-intercept model. This permitted the effects of the predictors to vary by trait pair (random-slope) but also allowed the general IPT for each trait pair to vary (random-intercept). In addition to the higher order interaction terms, we included the categorical variable participant, which corrected for differences between participants in the extent to which they tended to see trait pairs as more or less correlated.

Overall, participants pattern projected from the targets they learned about (B = 70.49, SE = 25.87), t(9,895.30) = 2.73, p = .01, semipartial R^2 = .0011. But also, the degree of pattern projection depended on the processing task condition to which they had been assigned (B = 36.24, SE = 18.79), t(3,503.21) = 1.93, p = .05, semipartial R^2 = .0011. Participants prompted to generate causal trait theories to explain a specific target began to pattern project from that target (B = 106.83, SE = 31.33), t = 3.41, p = .002. Participants in the control condition, who were prompted to analyze the trait-based information in a piecemeal fashion, did not pattern project from the target (B = 34.19, SE = 32.74), t = 1.04, $p > .29$. AQ: 4

But note that our central hypothesis is more nuanced. That is, we do not predict that people will pattern project from someone else merely because they have *attempted* to generate a causal trait theory about that person. Instead, people should be especially likely to pattern project from the target when they find they are able to generate such a causal trait theory. A Patterning $\times$ Pro-

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Fn9 cessing Task × Difficulty[9] interaction revealed that those who were more successful in generating causal narratives about a target showed greater evidence of pattern projection from the targets (B = −62.87, *SE* = 19.17), *t*(3,553.04) = 3.28, *p* = .001, semipartial R^2 = .0030. For those who generated causal trait theories about the target, they pattern projected from that target when they found it relatively easy (−1 standard deviation) to AQ: 5 generate this narrative, *t* = 4.95 *p* < .001, but not when they found it difficult (+1 standard deviation) to do so (*t* < 1). Participants in the control condition did not pattern project from the target, regardless of whether the found it easy or difficult (*t*s < 1.13, *p*s > F3 .26) to describe the traits the target possessed (see Figure 3).

These findings still leave open the question of whether writing a causal trait theory about a person influenced the way people thought about people in general (i.e., their IPTs) for a different reason—enhanced memory for details of the target (Hamilton, Katz, & Leirer, 1980). People better remember two contiguous stimuli when they are brought into the same perceptual unit, such as when they are seen as cause and effect (Asch, 1946). And as these previously documented findings foreshadowed, participants in the causal trait theory condition did indeed have a better memory for the targets' standing along the traits (*M* = 10.19, *SD* = 2.06) than did those in the control condition (*M* = 9.20, *SD* = 2.40), *t*(386.53) = 4.46, *p* < .001, *d* = 0.44. There was no evidence, however, that superior memory for the trait information was the mediator responsible for the impact of causal trait theory generation on pattern projection. When memory (as well as the higher order interactions) was added to the model, an accurate memory for trait-based information about the targets did not enhance the chance that participants would pattern project from them (B = 29.15, *SE* = 20.74), *t*(90.89) = 1.41, *p* > .16. Further, the Patterning × Processing Task interaction and the Patterning × Processing Task × Difficulty interaction remained significant: *t*(849.28) = 1.94, *p* = .05, and *t*(2,401.83) = 3.27, *p* = .001, respectively. Instead, it is the (successful) generation of a causal trait theory that *causes* pattern projection: In support of the quantity hypothesis, participants prompted to generate causal trait theories about others began to pattern project from them.

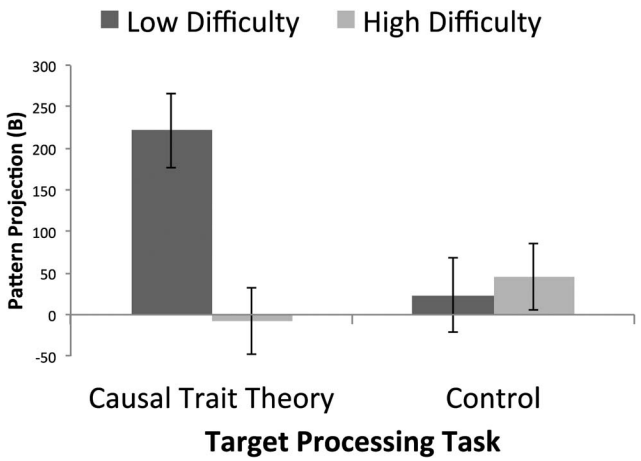

Figure 3. Pattern projection from the novel social targets as a function of processing task condition and the difficulty participants had with the processing task (Study 3). High and low difficulty is predicted at ±1 standard deviation from the mean level of self-reported difficulty in the respective processing task condition. The error bars reflect ±1 standard error of the estimate of the beta that corresponds to pattern projection. Because implicit personality theories were measured somewhat differently in Study 2 than they were in Studies 3 and 4, it is not meaningful to compare betas across those studies.

Study 4

We have argued that causal trait theories underlie pattern projection because an explanation that accounts for trait co-occurrence within a single person can be easily exported to be a more general theory of human personality—that is, an IPT. But Study 2 found that the greater quantity of theories to explain the self versus someone else did not fully explain why pattern projection is egocentric. For our final study, we differentiated two origins of causal trait theories, a distinction that will ultimately help explain why pattern projection is egocentric.

We suggest that causal trait theories are sometimes prompted by the observation of a person's behavior in a *single context* (e.g., "She is being very talkative but not very polite right now"). But in other cases, causal trait theories are created after reflecting on why different trait-relevant behaviors a person shows across *multiple contexts* coexist (e.g., "He is very talkative, much as he was at last night's party, but also not that polite, like when he was curt with the waiter"). Single-context theories are in the service of making sense of behavior one has observed, whereas multiple-context theories are in the service of making sense of someone's overall personality. We suggest that multiple-context theories, as true theories about personality (instead of about why trait-relevant behaviors would co-occur as they do in a specific situation), are more likely to be exported to characterize one's general IPTs. From our vantage point as an outside observer, we would seem to be more likely to seek to explain why others behave as they do in a given context (i.e., create single-context theories). But given that the self is, by definition, with itself in every context through which it lives, we expected that people would be more likely to create multiple-context theories about the self. In combination, this would help explain another reason why pattern projection is egocentric.

Pilot Study 1: Do Causal Trait Theories for the Self (vs. Another) Skew Toward Multiple-Context Theories?

We explained to 132 Americans on Amazon Mechanical Turk (https://www.mturk.com/) what a causal trait theory is and the distinction between a single-context and a multiple-context theory. Participants answered two questions, indicating whether the extent to which causal trait theories they have to describe themselves or someone else (e.g., a roommate, a coworker) tend to be multiple-context (1) or single-context (9) theories. Participants reported having relatively more multiple-context theories (vs. single-

[9] People found it marginally more difficult to complete the control task (*M* = 2.70, *SE* = 0.037) than the causal narrative task (*M* = 2.60, *SE* = 0.036), *F*(1, 399) = 3.23, *p* = .07, η_p^2 = .01. As such, we standardized the difficulty ratings separately by processing task condition before running the model.

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context theories) that explained the self ($M = 4.37$, $SD = 2.02$) as opposed to someone else ($M = 5.10$, $SD = 1.96$), paired $t(131) = 3.50$, $p = .001$, $d = 0.30$.

Pilot Study 2: Are Multiple-Context (vs. Single-Context) Theories More Common in Explaining the Self?

A second pilot study explored the converse question. We described to 193 undergraduates at the University of California, Berkeley, the same three constructs: causal trait theory, single-context theory, and multiple-context theory. Again, participants answered two questions, indicating whether the multiple-context theories and single-context theories they hold are more likely to describe the self (1) or their freshman-year roommate (9). In this study, the endpoints were counterbalanced, but responses were coded to match this form. Offering convergent support for our proposal, participants reported that their multiple-context theories were more likely to feature the self ($M = 4.17$, $SD = 2.04$) than were their single-context theories ($M = 5.22$, $SD = 2.09$), paired $t(191) = 4.47$, $p < .001$, $d = 0.32$.

In combination, the two pilot studies support our proposal that causal trait theories for the self versus another tend to differ in the breadth of their origin. If it were shown that causal trait theories that draw on information from multiple contexts lead to more pattern projection than those that draw on information from a single context, then this would demonstrate a second reason why pattern projection is egocentric.

To test the breadth hypothesis, participants in Study 4 received behavioral information about (and provided by) a yoked participant. This information described how the yoked participants displayed their typical standing on two traits in a single context or described two distinct contexts in which they displayed their typical standing on each trait individually. Participants then attempted to generate a causal trait theory on the basis of this *single-context* or *multiple-context* information. Our primary prediction was that participants would be more likely to pattern project those theories generated on the basis of multiple contexts than those generated on the basis of a single context.

Method

Participants and design. Two hundred and five undergraduates at the University of California, Berkeley, participated in a study, for which they received course credit or $15. Each participant was yoked to one of 81 participants who participated in an earlier session run for the purpose of generating materials for the present study.

Procedure. In the stimulus-construction sessions, the yoked participants first rated themselves on 12 traits from 1 (*not at all*) to 11 (*extremely*). Next, participants were asked to recall and write about 18 different behavioral episodes from their lives. For 12 of those behavioral episodes, participants were supposed to write about a time that they displayed their typical standing on one of the 12 traits they had rated earlier. Thus, they supplied 12 distinct single-context episodes. For the other six behavioral episodes, participants were supposed to recall a single context in which they displayed their typical level on two specified traits. Thus, for each of these six pair of traits, we had behavioral information describing the participants' typical standing on these traits that came from a single context or that came from multiple contexts. These yoked participants were reminded before providing each behavioral episode that they should provide a detailed description with the knowledge that someone else would be reading what they wrote.

When the new crop of participants came to the lab for the main study, they first rated themselves on the same 12 traits, from 1 (*not at all*) to 11 (*extremely*). Next, they received a packet with behavioral information that had been provided by one of the participants from the original, stimulus-generating set. The packet included the previous participant's ratings of his or her own personality as well as exactly half of the behavioral episodes the participant had recalled. Participants received three of the single-context memories—each a description of a time when the previous participant had displayed his or her typical standing on two different traits in the same context. Participants learned about the yoked participant's standing on the other six traits through six multiple-context memories. In this way, participants always learned about the traits in pairs, but it was varied whether the memories came from a single episode or multiple episodes. We yoked at least two participants to each previous participant and counterbalanced for which trait pairs the single-context and the multiple-context memories were provided.

Participants began by reading all of the information in the packet—the ratings and the behavioral memories. Next, we had participants go back through the packet but focus their attention on one pair of traits at a time. Just to reiterate, for three trait pairs participants learned about the target from two distinct episodes (one for each trait), whereas for the other half of trait pairs their attention was focused on one single episode that reflected both traits. After participants reviewed this information, they were asked to attempt to do their best to generate a causal trait theory to explain the trait co-occurrence. Participants were given 90 s to type a theory.

After completing each theory, participants reported on the difficulty of generating their theory ("How difficult was it to create the theory?") and their confidence in it ("How confident are you that the explanation is accurate?"). Both reports were made on scales from 1 (*not at all*) to 7 (*completely*). The two items were negatively correlated ($r = -.55$), so we created a difference score to reflect *difficulty* with the theory-generation task.

After trying to generate all six causal trait theories, participants then completed a series of conditional and marginal probability judgments from which their IPTs could be extracted. More specifically, participants answered conditional probability questions of this form: "If all you knew about someone was that they were [Trait X], how likely is it that that person would be [Trait Y]?" In addition, participants made marginal probability judgments of the following form: "What percentage of people would you say are [Trait X]?" We extracted IPTs in the same way as in Study 3 (see also Critcher & Dunning, 2009).

Results

Although all participants received behavioral information about the same six pairs of traits, some participants learned about the previous participant's standing on the two traits through behavioral information from multiple contexts, whereas others received information from a single context. To test whether causal trait

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theories generated with behavioral information from multiple contexts (vs. a single context) led to more pattern projection, we tested a random-slope, random-intercept multilevel model predicting participants' IPTs. We defined three Level 1 variables nested within trait pair: *behavioral-information* (+1 = multiple contexts, −1 = single context), *yoked-difference* (the absolute value difference in trait ratings—for a particular trait pair—for the previous participant to whom the participant was yoked), and *self-difference* (to control for pattern projection from the self). Finally, we included a random effect of *participant*, which controlled for each participant's general tendency to see traits as more or less positively correlated.

Of key interest was the Yoked-Difference × Behavioral-Information interaction term. This could tell us whether the degree of pattern projection from the yoked participant depended on the nature of the behavioral information received from that yoked participant. As predicted, this interaction term was significant (B = 89.26, *SE* = 40.34), $t(1,160.74) = 2.21$, $p = .03$, semipartial $R^2 = .0042$. When participants generated causal trait theories about the past participant on the basis of multiple-context information, they pattern projected from the yoked participant (B = 202.89, *SE* = 89.49), $t(6,861.51) = 2.27$, $p = .02$, semipartial $R^2 = .0007$. However, when participants developed causal trait theories from single-context information, they did not (B = 24.47, *SE* = 88.00, $t < 1$).

Thus, by prompting causal trait theories about others based on information that more closely reflects the origin of such theories about the self (i.e., behavioral information from multiple contexts instead of a single context), participants began to pattern project from those others. However, an alternate account is that people may simply have more difficulty developing causal trait theories when they can only draw on information from one context. Our data suggest that this alternative account is unlikely in that we found that participants actually experienced *more* difficulty trying to generate causal trait theories from multiple contexts ($M = -0.13$, $SD = 2.82$) than from a single context ($M = -0.67$, $SD = 2.83$), $t(1,014.00) = 3.98$, $p < .001$.

To more conclusively show that pattern projection was traceable to differences in the breadth (single-context or multiple-context) of the behavioral information on which causal trait theories were based, and not to the difficulty of generating a causal trait theory based on behavioral information from a single context versus multiple contexts, we included the difficulty composite as well as higher level interaction terms in our model. In this analysis, the crucial Yoked-Difference × Behavioral-Information interaction remained significant (B = −93.19, *SE* = 40.22), $t(1,125.36) = 2.32$, $p = .02$, semipartial $R^2 = .0047$. Notably, the Yoked-Difference × Difficulty interaction was also significant (B = −97.37, *SE* = 41.96), $t(858.75) = 2.32$, $p = .02$, semipartial $R^2 = .0062$, which replicated the finding observed in Study 3 that participants pattern projected less to the extent that they had difficulty generating a causal trait theory.

Discussion

The present study complemented Study 3 in identifying a second factor—beyond the mere creation of causal trait theories—that underlies pattern projection. Two pilot studies and the main study combined to support the breadth hypothesis—that causal trait theories that draw on information across contexts (as causal trait theories about the self are especially likely to do) are more likely to lead to pattern projection than causal trait theories that draw on information from a single context (such as when one seeks to make sense of another's behavior in a single episode).

These findings are also important because they address the alternative hypothesis that perhaps it is not causal trait theories but, instead, memories of specific instances when trait-relevant behaviors co-occurred that underlies pattern projection. This alternative would have predicted *more* (not less) pattern projection in the single-context condition. Some readers may wonder how the present findings square with Study 3's results, given that Study 3 participants pattern projected from others without receiving specific behavioral information about them. Note that our claim is not that causal trait theories can only be created when specific behavioral information is learned. Instead, we argue that causal trait theories are more likely to be exported (i.e., pattern projected) when they reflect theories of how traits relate in a single person, not when they reflect speculation about how behaviors may co-occur in a single context. In actual social perception, we usually do not learn about people through abstract trait labels but, instead, by observing their behavior across one or more contexts (Asch, 1946).

General Discussion

People do not think of people's personalities in merely descriptive terms ("I am not very wordy; I am ambitious") but in explanatory terms ("I am not very wordy because I am ambitious: Chatterboxes annoy others and get left out from things"). The present article has identified such explanations as *causal trait theories*. People tend to have more causal trait theories for the self than they do for others. Further, these theories are more likely to be attempts to explain properties of the self observed across different contexts than they are to be theories that attempt to explain behavioral co-occurrence in a single context. To be sure, people can create causal trait theories about others, but those theories are less likely to draw on behavioral information from multiple contexts but, instead, seek to explain why a person is behaving in the various ways that he or she is in a single context.

Beyond documenting the existence and exploring the properties of causal trait theories, the present studies showed how this construct assists in resolving a lingering mystery in the social cognition literature. Critcher and Dunning (2009) provided evidence of egocentric pattern projection—a qualitatively novel way in which the self influences social judgment—but conceded that it was unclear exactly why pattern projection arises. By introducing the notion of causal trait theories, the present studies identified the aspect of person perception that gives rise to pattern projection and specified how differences in the quantity and origin of self-knowledge versus social knowledge explain why pattern projection is egocentric.

At its core, our account reasoned that causal trait theories—explanations for why two traits co-occur in a sample of one—might be generalized to become a theory of how two traits tend to relate in people in general. Consistent with this account, people pattern projected more (from the self or from an other) when they reported having a causal trait theory to explain why two traits co-occurred as they did in that person (Study 2). Because people reported a larger *quantity* of causal trait theories about the self than

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about someone else, this suggests one reason that pattern projection is egocentric. And indeed, when participants were prompted to generate causal trait theories (and, thus, not simply learn trait information) about another person, they began to pattern project from that person (Study 3).

But the difference in number of causal trait theories does not fully explain the egocentric nature of pattern projection: Study 2 found that causal trait theories about the self are more likely to be pattern projected than are causal trait theories about an other. Two pilot studies found that people generate causal trait theories about the self versus about others in different circumstances, meaning that such theories have *origins* in different types of information. Causal trait theories about the self are more likely to be theories that try to explain why one has two traits that emerge as they do across a breadth of contexts. This is a theory about one's personality that can then be generalized as a more general theory of personality. Causal trait theories about others are relatively more likely to be theories about why people behaved as they did in a single context. These are theories of why traits coexist in a single situation and, as such, are less easily exported as general theories of personality. And indeed, when people received behavioral information about yoked participants from multiple contexts, instead of a single context, they began to pattern project from them (Study 4).

Several features of our data suggest that causal trait theories are either special or operate above and beyond other factors in their facilitation of pattern projection. First, causal trait theories do not explain pattern projection merely because they serve as a marker of *semantic overlap* between two traits. By this alternative account, traits that share more similarity in meaning (e.g., bashful and reserved) are more likely to occur similarly in a person, to be seen as correlated in people's IPTs, and to be explained by a causal trait theory versus not. We have already discussed how this alternative would be hard to square with our correlational study (Study 2), but it certainly cannot account for our experimental ones in which participants showed more or less pattern projection from others depending on whether they were prompted to think about another in the way they tend to think about the self (Studies 3 and 4).

Second, pattern projection does not merely stem from memories or knowledge of the *episodic co-occurrence* of two traits—that is, memories of when two traits occurred together. In the single-context condition in Study 4, participants learned how two traits co-occurred in a single episode. If it were episodic co-occurrence, and not causal trait theories, that underlay pattern projection, we would have seen more, not the predicted less, evidence of pattern projection in the single-context condition—that is, when causal trait theories were informed by such co-occurrence.

Third, pattern projection does not stem merely from two traits being connected as part of an *indirect theory*, two traits that are indirectly connected in a self-narrative. Instead, pattern projection requires that people have a theory of why two traits are directly linked. As reported in Footnote 7, we replicated Study 2's finding that the presence of causal trait theories in the self predicts pattern projection, but traits that were explained merely by a third-variable cause (an explanation not of why the two traits are directly linked but of why they both are products of the same third variable) were not pattern projected more.

Finally, note that our explanation for egocentric pattern projection embraces a *weak* form of egocentrism—an account that does not claim that the self's advantage in pattern projection is necessary but one that identifies where the self's greater influence comes from. First, the self has more causal trait theories to understand the self. But as Study 3 showed, by prompting people to think about others in terms of causal trait theories (as opposed to in a more in-depth but piecemeal manner), pattern projection from that other increased. Second, causal trait theories about the self are more likely to lean on behavioral information from a greater breadth of contexts. And when people's causal trait theories about others begin to rely on information from multiple contexts, the causal trait theories they create to understand those others are more strongly pattern projected.

Why Are There More Causal Trait Theories to Explain the Self Than to Explain Another?

But if this egocentrism can be overcome, why isn't it? Although the present article shows that one reason pattern projection is egocentric is the larger number of causal trait theories to explain the self than someone else, we did not address why exactly it is that people engage in more theorizing for the self than for others. Here, we consider three factors that might explain this difference and assess the plausibility of each:

The self thinks about itself more. One intuitively appealing answer, but one that we find ultimately incomplete, is that the self is the object of its own thoughts more than are other people. In all of that egocentric thought, there would simply be more of a chance for people to elaborate causal trait theories to understand the self. Although there is no doubt some truth in this statement, it seems unlikely to offer a complete explanation. For example, Critcher and Dunning (2009) gave false personality feedback on fictitious personality dimensions (V/Z dominance, front/back brainedness) about the self or about someone else. Even though participants had the same amount of (limited) time to consider this information about the self as they did about someone else, they still pattern projected the newly learned information more when it was said to describe the self instead of someone else.

The self is motivated to explain the greater cross-situational variability it observes in itself versus others. A second possibility, but one that we also ultimately reject, is that the nature of the self's own trait-based understanding more naturally lends itself to causal trait theory construction. The better we get to know a person, the more we observe inconsistencies in his or her behavior (Prentice, 1990). It should, thus, be relatively unsurprising that the self sees more cross-situational variability in its own behavior than in others' (Monson et al., 1980). At first glance, it might seem that such observed variability might facilitate the construction of causal trait theories. That is, understanding what cues are present (or absent) when one displays (or does not display) a trait may help to explain why the trait emerges. The problem with this intuition is that these causal antecedents are most likely going to be variable aspects of a situation instead of stable aspects of the person. And in fact, as Study 1c showed, people are more likely to develop causal trait theories to explain stable traits. Thus, the fact that people have more causal trait theories to explain the self, even as they observe more cross-situational variability in the self, speaks to just how impressive the egocentric nature of causal trait theorizing is. But also, research suggesting that people see less cross-situational variability for their own internal or covert traits (Goldberg, 1981) gives some hint as to which traits are most likely to be AQ: 6

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included in causal trait theories. Future research is needed to more fully explore for what types of traits causal trait theories are likely to emerge.

Causal trait theorizing satisfies self-understanding more than social understanding. A third possibility, which we see as the most plausible candidate of the three, is that people may be more motivated to construct theories of themselves because of the different functions of self-knowledge versus social knowledge. In particular, social knowledge may be amassed with an eye toward prediction, whereas self-knowledge may aim toward understanding. Knowing whether a friend is introverted is useful in determining whether to invite him to a raucous party. Trait labels provide simple, helpful summaries of others' preferences or dispositions. A causal trait theory, in contrast, is unlikely to yield the same predictive returns.

Self-knowledge is less in the service of behavioral prediction (given that the self necessarily has less uncertainty about how it will behave) than it is (at least in part) in the service of achieving the basic epistemic goal of self-understanding or self-assessment (Festinger, 1954; Sedikides, 1993; Sedikides & Strube, 1997). Causal trait theories reflect a deeper form of insight than mere trait ascriptions. Further, even when people do have deeper curiosities about others, they may find that they need to generate fewer causal trait theories about another (as opposed to the self) before feeling that they have reached a deep understanding of that person. We look inward and see complex selves, with much hidden beneath the surface, whereas we feel others' observable behavior offers a relatively complete picture of their personalities (Pronin, Kruger, Savitsky, & Ross, 2001). Thus, our desire for self-knowledge may push us not only to generate causal trait theories about the self to explain these intricacies beneath the surface but to persevere in creating more theories before we reach the same level of epistemic satisfaction that we would were we creating the theories about another.

Comparing Causal Trait Theories to Life Narratives

Previous research has noted that our sense of self moves beyond mere trait ascription toward fuller life narratives in an effort to see the self as a "coherent whole" and gain a full "understanding of ourselves and our goals and actions" (Baddeley & Singer, 2010, p. 200) in a way that permits us to see causal connections in our lives (Reese, Yan, Jack, & Hayne, 2010). The construction of a life narrative allows the self to be a storyteller (Bruner, 1990). Life narratives piece together important and meaningful episodes into a thread that offers a causally coherent storyline of one's life and identity (e.g., Eagan & Thorne, 2010; King, Burton, & Geise, 2009). Further, life narratives can be thought of as largely independent of traits—neither deriving from them (Bauer & McAdams, 2004) nor predicting life outcomes (e.g., subjective well-being) in a way that is redundant with them (Bauer & McAdams, 2010).

The development of both causal trait theories and life narratives reflects a sense that the self is a more coherent and integrated entity than a list of descriptors might imply. Both involve extending beyond factual information to include interpretive information (see Pasupathi & Wainryb, 2010). Whereas life narratives attempt to draw semantic conclusions from *episodic* information about the self (McAdams & McLean, 2013), causal trait theories reflect deeper semantic engagement with prior *semantic* conclusions about the self (i.e., traits). And although life narratives at times seek to explain why a person has the traits he or she does today, such explanations lean on formative episodes in one's past instead of other traits in the self (Habermas & Bluck, 2000). In this sense, causal trait theories may reflect a deeper form of attribution—one that does not merely see "the person" as an attributional end in itself (Kelley, 1967; cf. Malle, Knobe, & Nelson, 2007) but that attempts to go one step deeper by explaining why "the person" is who he or she is.

Nonetheless, causal trait theories and life narratives may fulfill similar epistemic goals. Both permit people to create a coherent understanding of themselves instead of having merely disjointed person representations that lean on piecemeal descriptors. If causal trait theories and life narratives serve similar functions, it would be interesting to see whether those most likely to have well-elaborated narratives are more or less likely to have more causal trait theories. On the one hand, those with a greater orientation toward self-analysis and self-understanding may spend more time developing both. On the other hand, people may prefer to take one approach to self-knowledge or the other. That is, people may adopt a more artistic view by seeing the self as the protagonist in an ongoing story (Bruner, 2002) or a more scientific view by seeing one's own traits and dispositions as mysteries that can be explained by other such traits and dispositions.

Interpersonal Trait Narratives, Interpersonal Pattern Projection

Causal trait theories need not refer only to intrapersonal trait dynamics. They could refer to interpersonal trait dynamics as well. People will include their conceptions of close others in the self (Aron et al., 2004; Wright, Aron, & Tropp, 2002), and members of collectivist cultures may naturally have a more expansive view of the self (Markus & Kitayama, 1991). Thus, people's trait theories may expand to include features of others as well. Such theories may include explanations for why traits in the self relate to, influence, or are influenced by traits in close others.

Interpersonal trait theories may then produce pattern projection at the dyadic level. For example, romantic couples may co-construct theories for why a trait in one partner has given rise to a trait in the other (see Fivush, Bohanek, & Marin, 2010, for discussion of life narrative co-construction). The couple may then generalize these theories and use them as bases for expectations about new couples they meet. In this way, interpersonal pattern projection will look similar to standard pattern projection, except the two component traits reside in separate people instead of in the same person. But interpersonal pattern projection would also permit projection of the same traits (e.g., one partner's high neuroticism paired with the other partner's low neuroticism). These possibilities await testing by future research.

Conclusion

The present research identified a new way we think about a person (i.e., the causal trait theory), used this construct to explain the emergence of pattern projection, and then explained why pattern projection emerges egocentrically. We suspect that the value of causal trait theories need not end with pattern projection

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but may persist as an interesting construct to examine further in its own right. Much as psychologists spent decades understanding how people make attributions about the causes of behavior, there is clearly much to understand about how people make attributions about the origins of personality. Future research should look not only to better understand when and why these theories are formed but also to identify additional outcomes that such theories predict.

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