Mindreading and tacit knowledge

Action Editor: Paul Bello

Sarah Robins *

University of Kansas, Department of Philosophy, Wescoe Hall, 1445 Jayhawk Blvd., Lawrence, KS 66045-7590, United States

Abstract

Debate over the nature of mindreading proceeds on the assumption that theory and simulation offer distinct characterizations of this ability. The *threat of collapse* objection questions this assumption, suggesting that simulation collapses into theory because both are committed to mindreading as tacit knowledge. Although both sides dismiss this objection, I argue that the threat is real. Theory and simulation are both accounts of mindreading as tacit knowledge and so the debate between them collapses.
© 2013 Elsevier B.V. All rights reserved.

Keywords: Mindreading; Theory–theory; Simulation; Tacit knowledge

1. Introduction

The debate over the nature of mindreading proceeds on the assumption that theory–theory and simulation theory offer distinct characterizations of our ability to explain and predict the behavior of others.[1] Theory–theorists argue that our ability to mindread is made possible by possession of a theory, albeit a tacit one. Simulation theorists argue that the inaccessibility of this alleged theory is a mark against the theory–theory proposal and offer an alternative account of mindreading as theory-less simulation of other minds. As characterized, this debate makes sense only so long as there is a difference between mindreading via use of a tacit theory and mindreading via simulation.

Proponents of the *threat of collapse* objection (e.g., Dennett, 1987; Heal, 1994) challenge this assumption,

arguing that simulation collapses into theory because both are committed to mindreading via tacit knowledge. While both theory–theorists (Davies & Stone, 2001) and simulation theorists (Goldman, 2006) resist this conclusion, I contend that the threat is real. In what follows, I argue that those involved in the debate over the nature of mindreading should pay closer attention to the requirements for tacit knowledge, and that doing so reveals two important conclusions. First, Goldman's account of process-driven simulation collapses into a variant of theory–theory; it cannot be saved in the way that Davies and Stone propose, nor can Goldman himself prevent the collapse. Second, the collapse extends to all other versions of simulation theory. In order to explain the ability to mindread, simulation must involve mental state ascriptions, and so there is no way to avoid characterization of simulation as appeal to tacit, psychological knowledge. By recognizing the collapse of simulation, we can abandon the view of mindreading as an entrenched debate between theory–theorists and simulation theorists, refocusing on the shared aim of best characterizing this ability.

2. Two views of the nature of mindreading

Mindreading refers to our sophisticated yet implicit ability to explain and predict the behavior of ourselves and

---

* Tel.: +1 785 864 3976.
 E-mail address: skrobins@ku.edu.

[1] *Mindreading* should be understood as roughly synonymous with *folk psychology*, *theory of mind*, *perspective taking*, and so on. Gordon (2009) and other proponents of the Embodied Cognition View (e.g., Gallagher, 2007) take issue with the presumption that social cognition requires appeal to mental states. For the purposes of this paper, I do not question this assumption. However, my claim that the mindreading debate collapses should come as welcome news to proponents of the Embodied Cognition View, as it serves to corral their opponents.

others in terms of underlying mental states—most commonly beliefs and desires, but also hopes, fears, hunches, and the like. Suppose, for example, that I am trying to predict whether you will go see the newest action movie at the cinema. My speculation about what you will do will almost certainly involve appeal to your mental states: whether you prefer documentaries, believe that box office ticket prices have become exorbitant, or fear going out in public. All of these—and more—will be used to generate my prediction. I arrive at an answer by coupling them with an understanding of how mental states connect to one another and to behavior. The disagreement between theory–theorists and simulation theorists concerns how to best characterize this understanding that mindreading requires. In this section, I provide an overview of theory–theory and simulation theory, focusing on the versions developed by Stich and Nichols (2003) and Goldman (2006), respectively.[2]

2.1. Theory–theory

Theory–theorists claim that our ability to predict and explain the behavior of others requires the possession of a body of knowledge about mental states and their interrelations, and further, that this body of knowledge is best described as a theory (Morton, 1980). Sellars (1956) is often credited as the source of this claim, as he put forth the idea of "folk psychology" in his mythical account of Jones—a (fictional) ancestor who initiated the practice of speaking about behavior as caused by hidden, inner states like beliefs and desires.[3]

While all theory–theorists subscribe to the idea that folk psychological practice relies upon a theory of folk psychology, theory–theorists differ amongst themselves as to what this theory involves.[4] Some believe that the theory is a set

of law-like generalizations, exhibiting a deductive nomological structure (Fodor, 1987) while others contend that the theory is comprised of a small set of core heuristics (Botterill, 1996). Still others do not take a stand, allowing any body of internally represented psychological information to count as theoretical (Stich & Nichols, 1995, 2003).

Stich and Nichols' broad characterization is the widely accepted one, as it is compatible with the predominant information-processing approach to cognition. On their view, mindreading is theoretical so long as it "exploit(s) an internally represented body of information about psychological processes and the ways in which they give rise to behavior" (1995, p. 88). Stich and Nichols resist not only a particular account of theories, but also any particular account of mental representation or cognitive architecture. Leaving these matters unsettled is not intended as a signal of their unimportance, but rather as an acknowledgement that such debates are to be had *within* theory–theory and are thereby orthogonal to debates *between* theory–theory and simulation.

Theory–theorists agree that, whatever its structure, our folk psychological theory is tacit. Some claim it to be only "weakly tacit" (Botterill, 1996), but most draw on an analogy between the tenets of folk psychology and the grammatical rules of a language (e.g., Carruthers, 1996; Jackson, 2000).[5] In much the same way that we cannot articulate the rules we follow when we understand a language and yet have no difficulty speaking grammatically and detecting ungrammatical sentences, so too proponents of theory–theory claim that our everyday interactions with one another are guided by a folk psychological theory that we understand but cannot articulate. Aside from this analogy, theory–theorists say little about the nature of tacit psychological knowledge and the requirements for its attribution. And yet, the claim remains critical to the view. The reliance of mindreading upon tacit knowledge is often described as the "prevailing assumption in the empirical research on folk psychology" (Nichols, 2002).

2.2. Simulation theory

Simulation theory is best understood contrastively, as an alternative to the dominant, theory–theory view.[6] Simulation theorists reject the claim that mindreading requires a sophisticated body of theoretical knowledge and focus instead on our ability to project ourselves into the mental perspective of another person. The simulation process takes various names: imaginatively identifying

---

[2] My review leaves out what is often characterized as a third position: the Rationality view. Proponents of the Rationality view claim that when we engage in mindreading we are using a theory of rationality to explain how others should act and predict what they will do on the basis of our understanding of normative principles of reasoning and choice (e.g., Dennett, 1987; Heal, 2003). I view these accounts as personal level descriptions of mindreading that could be amenable to implementation by either by theory or simulation. For example, Heal's notion of co-reasoning is often depicted as personal-level simulation (Davies & Stone, 2001).

[3] Lewis (1972) offers a detailed account of how this theory could be understood. On his view, the set of folk statements we use to explain one another can be conjoined so as to create the theory of folk psychology. From here, each of our mental state terms is defined by the role it plays in this theory (i.e., a belief just is whatever state mediates between the behaviors and other mental states that are listed as being related in our commonsense statements). These functional roles implicitly define each term, which can be made explicit via Ramsification: by conjoining all of our folk statements, replacing mental state terms with variables, and then existentially quantifying over those variables, each term is defined without circularity.

[4] Theory-theorists also differ in whether or not they consider the theory to be innate (Carruthers, 1996; Fodor, 1992) or learned (Perner, 1991; Wellman, 1990), or perhaps even learned by a process amenable to theory revision in science (Gopnik & Meltzoff, 1997). There are also differences in terms of whether the ability is thought of as modular (Baron-Cohen 1995; Carruthers, 2006) or not (Leslie, 2000).

[5] For Botterill, a weakly tacit theory is one that is "unstated, but recoverable" (1996, p. 113). Chomsky (1986) offers a characterization of our linguistic abilities in terms of tacit understanding.

[6] Although all simulation theorists agree that theory-theory is the dominant view from within the debate over the nature of mindreading, some theorists have noted the significance of simulation-style accounts of cognition from the Verstehen tradition that predate theory-theory (Heal, 2003).

(Goldman, 1989), co-reasoning (Heal, 2003), radical simulation (Gordon, 1995), recreative imagining (Currie & Ravenscroft, 2002), and so on. These views share a commitment to the idea that simulation offers an account of mindreading that is less burdensome than the one given by theory–theory.

As with theory–theorists, simulation theorists differ in their particular commitments. Some believe that the ability to simulate others is underwritten by direct access to our own mental states (Goldman, 1989; Harris, 1989, 2006). Others claim that knowledge about the self and other is equally accessible (Gordon, 1986, 2008; Heal, 2003). There is also disagreement over whether the basis of simulation comes from our similarity to those we simulate (Goldman, 1989) or from assumptions of rationality (Heal, 2003).

On the simulation view, the greatest resource for understanding the minds of others is something every person easily possesses: a mind of her own. On the assumption that all minds are sufficiently similar, explaining other people is easy—you just imagine that you are the other person. As Goldman explains:

> A fundamental idea of simulation theory is that mind-readers capitalize on the fact that they themselves are decision-makers, hence possessors of decision-making capacities. To read the minds of others they need not consult a special chapter on human psychology, containing a theory about the human decision-making mechanism. Because they have one of those mechanisms themselves, they can simply run their mechanism on pretend inputs (2006, p. 20).

Goldman believes that the use of one's own decision-making processes results in substantially weaker demands on the mindreader than the attribution of tacit knowledge. But given the broad characterization of theory–theory as a body of psychological information, as given by Stich and Nichols (2003), it is unclear whether and to what degree these two views actually differ in their commitments. This is the issue to which I now turn: whether simulation can withstand the threat of collapse into theory–theory.

3. Prelude to collapse

The threatened collapse of theory and simulation could come about in several distinct ways. For instance, simulation and theory could be discovered to be explanations of separate practices, causing the debate to collapse for lack of a shared topic of interest. Or the debate could collapse because they each explain different, non-opposing aspects of the same practice.[7] Some theory–theorists now advocate

a hybrid view along these lines, according to which theory–theory and simulation are each sufficient to handle particular cases of mindreading (Currie & Ravenscroft, 2002; Mitchell, 2005; Perner & Kühberger, 2005). These are both neutral forms of collapse, attributing the debate's disintegration to a lack of genuine disagreement between the two views.

Given the current emphasis on simulation as a plausible *alternative* to theory–theory, the worries about collapse here are different. The question is whether the debate collapses in a non-neutral way, because simulation fails to offer a distinctive, non-theoretical account of mindreading. If this form of collapse occurred, then simulation would become a variant within theory–theory.[8] Over the course of the debate between theory–theorists and simulation theorists, there has been movement in this direction.

While the initial formulations of simulation denied any role for theory in the process of mindreading (Gordon, 1986; Heal, 1986), many simulationists now acknowledge that simulation requires some theoretical assumptions. This concession comes in response to theory–theorists' observation that simulation requires at least some background theoretical knowledge (Jackson, 1999; Stich & Nichols, 1995). When a person prepares to simulate the mental states of another person, the theory–theorist argues, she must make certain assumptions. For instance, she must assume that she is similar to the person she intends to simulate, otherwise she has no reason to expect her simulation to be successful. Davies and Stone (2001) offer an example of the required assumption:

> *Me-You Principle*: If, in circumstances C, my mental life would be thus-and-so then if O is in circumstances C then *ceteris paribus* O's mental life is thus-and-so (p. 142).[9]

As this is a generalization about psychological states, it is a piece of psychological theorizing. And since each instance of simulation draws on something like the Me–You Principle, no account of simulation can claim to be free of psychological theorizing. Many simulation theorists have been happy to grant this point (e.g., Currie & Ravenscroft, 2002; Goldman, 2006; Heal, 2003) and for good reason. First, it seems difficult to motivate why (or how) one could simulate without appeal to such a background assumption. Second, this principle does not challenge simulation's role in the process of mindreading. The Me–You Principle affords theorizing a background role. Once one is

---

[7] These can be different forms of collapse. Imagine you and I are debating the rock star status of the lead singer of Van Halen. Our debate would collapse in the first way if it turns out I am talking about David Lee Roth and you are talking about Sammy Hagar. It would collapse in the second way if we're both talking about David Lee Roth, but I am focused on his stage presence, while you are focused on his self-aggrandizing interviews.

[8] Which is not to say that simulation would fail to be the most plausible account of the nature of mindreading on offer, just that the account if offers would fail to be a non-theoretical one.

[9] If one's account of simulation (e.g., Heal, 1998) operates on assumptions about the rationality of the person to be simulated, then Davies and Stone suggest the following reformulation: Norm-You: if, in circumstances C, one's mental life should be thus-and-so then if O is in circumstances C then *ceteris paribus* O's mental life is thus-and-so (2001, p. 143).

prepared to mindread all that is needed is the ability to simulate, not theorize. Simulation remains intact and theory-free.[10]

These concessions—from theory–theorists and simulation theorists alike—narrow the scope of the disagreement between theory–theorists and simulation theorists. Still, how one chooses to characterize the debate's current stay of play tends to reflect one's theoretical point of origin. Theory–theorists characterize the reformed debate as one between "knowledge rich" and "knowledge poor" strategies (Davies & Stone, 2001, p. 145), while simulation theorists characterize it as one between those that recognize the importance of simulation and those that neglect it (Goldman, 2006, p. 46). The debate over the nature of mindreading persists, fueled by the assumption that theory and simulation make distinct contributions to the ability to explain and predict the behavior of others.

4. The threat of collapse

The threat of collapse objection states that simulation collapses into theory because simulation is itself the deployment of a psychological theory. The worry emerges because of the striking similarity between the descriptions of simulation and of tacit knowledge. The plausibility of this threat thus relies on the requirements for simulation and how closely they resemble those for tacit knowledge attribution. In this section, I review these requirements—as given in Goldman's account of process-driven simulation and the Evans–Davies account of tacit knowledge—and then conclude with Heal's argument that the former collapses into the latter.

4.1. Process-driven simulation

Goldman's (1989) account of process-driven simulation was created in response to Dennett's challenge to the simulation view. Dennett (1987) argues that simulation is possible only if one has theoretical knowledge of how things of the type being simulated function. If you want to simulate a suspension bridge, for example—speculating as to how it will withstand certain wind or traffic patterns—then you had better know a lot about suspension bridges. In much the same way, Dennett suggests, simulating psychological states relies upon knowledge about psychological states. Thus, endorsing simulation amounts to an endorsement of mindreading via psychological theory and the debate collapses.

Goldman (1989) responds by conceding that many types of simulation are theory-driven. But he maintains

that simulation via mindreading is different. His argument thus relies on the difference between how the simulation comes about in the case of suspension bridges and in the case of mindreading. Simulating a suspension bridge requires one to accumulate knowledge of how suspension bridges work because such knowledge is not something we possess without effort. There is no similar requirement when simulating another person, Goldman argues. We already possess the mechanisms required to carry out mindreading simulations—our own decision-making processes. Goldman thus invokes a distinction between theory-driven and process-driven simulation, the latter of which is meant to represent a fully non-theoretical alternative for characterizing the mechanisms involved in mindreading.

The requirements for process-driven simulation are as follows:

(1) The process that drives the simulation is the same as (or relevantly similar to) the process that drives the system, and
(2) The initial states of the simulating agent are the same as, or relevantly similar to, those of the target system (1989, p. 85).

Goldman concedes that mindreading *could* come about via theory-driven simulation, but thinks theory-driven simulation is unnecessary because process-driven simulation is also available. As he sees it, employing a theory is a slow and cognitively effortful task, making process-driven simulation a plausible and preferable way of explaining how we go about predicting others. He thus concludes that we often predict the mental states and subsequent behavior of others through process-driven simulation. Starting from the same place as the person to be simulated (a set of current beliefs and desires) and using the same process (the ability for practical reasoning), ensures that the simulator will arrive at the same, or at least similar, conclusion as the simulated. Goldman insists, "process-driven simulation does not collapse into theorizing" (2006, p. 32).

It remains unclear whether the difference between theory- and process-driven simulation provides sufficient insulation from the threat of collapse. Knowledge of suspension bridges and commonsense psychology may be *acquired* in different ways, but the difference in acquisition need not mark a difference in the nature of the knowledge acquired. That is, we may be forced to learn about suspension bridges through explicit instruction while our understanding of people is acquired implicitly, but in the end our understanding of each may constitute a body of tacit theoretical knowledge. Heal (1994) pursues this line of attack and suggests that Goldman's view of process-driven simulation collapses into an account of mindreading in terms of a tacitly known theory. To understand the charge requires first an understanding of tacit knowledge attribution.

---

[10] Gordon (1995) has remained opposed to the concessions of detailed here, denying that mindreading requires one to possess mental concepts. Heal (2003) offers an argument as to why even simulation must concede a role for psychological concepts and generalizations. In his most recent formulations of the view, Gordon (2008, 2009) suggests his view of simulation is most amenable to the embodied cognition view.

4.2. Tacit knowledge

Attributions of tacit knowledge derive from the observation that we often appear to "know more than we can tell" (Polanyi, 1966, p. 4). The idea that a person could know something and yet not be able to access or report on that knowledge invites skepticism as to whether the alleged knowledge actually exists. As such, tacit knowledge is not a concept invoked for its own sake, but rather one that emerges from a need to explain cognitive abilities that would be otherwise inexplicable.

An account of tacit knowledge must meet two challenges. First, the account must ensure that the person actually possesses the knowledge being attributed and is not simply behaving in a way that is compatible with such possession. Second, the account must guarantee that the person is using the particular form of the theory being attributed and not some other, extensionally equivalent form.[11] Meeting these requirements is important—crediting a person with tacit knowledge is supposed to explain her actions. If we make appeal to such knowledge in explaining an individual's behavior, then it had better be the case that knowledge of this theory was operative in her behaving as she did. If mindreading requires a tacit theory of psychological generalizations, for example, then attributing this theory to a person who is mindreading should explain what she does when she explains and predicts the behavior of others.

Many have thought that these challenges pose an intractable problem for accounts of tacit knowledge (Kripke, 1982; Quine, 1972; Wright, 1986;). These objections closely parallel those that arise in discussions of rule-following, and many respond by adopting skeptical or anti-realist views about tacit knowledge. Certainly, crafting a successful response to these challenges is no small task. But it is one that the proponent of mindreading as a tacit theory must take on board, or at least presume a way around, as they are committed to the existence of such a theory.[12] So while one *could* adopt a skeptical or anti-realist position regarding tacit knowledge, it is not an option of which the theory–theorist can avail herself.

Evans (1985) has proposed an account tacit knowledge that meets these challenges, explaining how a particular tacit theory of meaning could be attributed to a speaker of a given language. Davies (1987, 1989, 1995) has built a general theory of tacit knowledge from Evans' framework. Although the view was not developed with an eye to the issue of mindreading, it is reasonable to presume that theory–theorists would endorse the Evans–Davies account of tacit knowledge. Theory–theorists often draw an analogy between the tacit knowledge involved in mindreading and the tacit knowledge involved in understanding a grammar. As Davies develops Evans' view, it is an account focused on articulating tacit knowledge of the latter sort (Davies, 1989). While theory–theorists have never explicitly endorsed the view, neither have they denied it or proposed an alternative.

Evans argues that the two aforementioned challenges can be met by characterizing the tacit knowledge in terms of "full blooded" dispositions: causal states of the person that give rise to the behavior (1985, p. 329).[13] If such dispositional states can be identified and isolated, then there is potential for a match between the set of transitions characterized by the disposition and the set of inferences governed by the theory we want to attribute. That is, a person can be said to be using a tacit theory (and not merely acting in a way that conforms to it) if there is a match between the axioms knowledge of that theory. Call this the *mirroring constraint*.

Davies (1989) gives the example of a person who is being credited with tacit knowledge of the letter–sound correspondence rules that are employed for reading aloud. One rule in this system would be that all words that start with *d* should be pronounced /D/. In this case, the question is whether a person (tacitly) knows this rule, or has simply memorized the pronunciations for *dancer, delusional, doctrinarian*, etc. individually. On the Evans–Davies account, the difference between these two proposals can be determined by close observation of the causal-explanatory structure inside the person (Davies, 1995). If there is a single state in the person responsible for all pronunciations involving *d*-words, then we can reliably say that the organism has tacit knowledge of the principle of *d*-pronunciation. Given that recognition of the letter *d* reliably results in /D/ pronunciations, one might go so far as to say that attribution tacit knowledge of the *d*-/D/ rule is the *only* way to explain this behavior. From here, crediting the person with a particular (tacit) theory of letter-sound correspondences is simply a matter of scaling up: matching transitions between letters and pronunciations to the set of pronunciation principles that comprise the theory one claims is tacitly known. This characterization of a speaker's knowledge meets the mirroring constraint because it makes possible a close parallel between the structure of the theory and the structure of the speaker's ability. This allows the theory to be distinguished from its competitors and for it to feature in explanations of the speaker's competence.[14]

---

[11] In the case of formal theories, two theories are extensionally equivalent when they possess all the same theorems, but those theorems are derived from different axioms. In non-formal cases, two theories are extensionally equivalent when they explain all and only the same phenomena but through appeal to different principles.

[12] Recall from the overview in Section 2.1 that the idea of mindreading as tacit knowledge has been termed a "prevailing assumption" in the field.

[13] In requiring that these dispositions be full-blooded Evans is intending to block an anti-causal construal of these dispositional claims as logically equivalent to conditional statements, as is characteristic of the Rylean approach to dispositions (Ryle, 1949).

[14] Heal (1994) worries that this account of tacit knowledge is too promiscuous: certain systems may exhibit these transitions even while they are not candidates for knowledge attribution of any sort, tacit or otherwise. Both Peacocke (1994) and Davies and Stone (2001) argue that this can be done by restricting tacit knowledge attribution to representational systems. I do not elaborate on this restriction here.

4.3. Process-driven simulation as tacit knowledge

How does tacit knowledge entail the collapse of simulation? Recall that Goldman's account of process-driven simulation requires that the transitions being made within the mind of the simulator are sufficiently similar to those being made within the mind of the person being simulated. Process-driven simulation works when the simulator mirrors the mental transitions of the person she is trying to explain or predict. Although simulation theorists do not focus on this possibility, there could also be a theory of how mental states interact with one another during simulation that mirrors both the simulator and simulated. This theory will include inferences about the relations between mental states and the connections between mental states and behavior; it will be a psychological theory. Such a theory would meet the mirroring constraint identified above.

As Heal explains, the structural match required for tacit knowledge attribution is practically guaranteed by the goal of simulation:

> The input and output to the supposed simulation process are both explicitly represented psychological states...given this, then it seems likely that we shall discover certain patterns of causal dependence between input representations and output representations. And it is also probable that the pattern will have an overall shape which strongly suggests interior mediating structures of the kind which in turn license attribution of knowledge of a tacit theory. This is so because, *ex hypothesi*, we are imagining that there could be some theory which would produce the same, i.e. the successful, predictions (1994, p. 131).

If Heal's threat meets its mark, then Goldman's attempt to avoid the collapse of theory-driven simulation fails. Process-driven simulation amounts to endorsement of a tacitly known psychological theory.

5. Responding to the threat

5.1. Saving simulation

Davies and Stone (2001) argue that Goldman's view of simulation can withstand this threat of collapse. They begin by granting Heal's claim, in the form of a conditional: if the states used in simulation involve systematic transitions between psychological representations, then simulation is tacit knowledge of a psychological theory. They deny, however, that instances of process-driven simulation involve such transitions. In simulation, the transitions occur between non-psychological statements about the world, and so, the view avoids collapsing into a variant of theory–theory.

Davies and Stone illustrate simulation's continued viability with an example. Suppose Vincent is trying to predict what Yvonne believes. Vincent knows, for example, that

Yvonne believes *A or B* and *not-B* and wants to know whether or not she believes *A*. According to simulation, Vincent uses his own decision-making capacities to come to a conclusion about what Yvonne will do or believe, given her current set of psychological states. Davies and Stone propose that Vincent's mental simulation would proceed as follows:

T1: Statement of Yvonne's beliefs (A or B, not-B)
T2: Own thoughts (A or B, not-B)
T3: Own conclusion A
T4: Prediction: Yvonne believes A (2001: 160).

The transitions from T1 to T2 and from T3 to T4 require Vincent to possess something like the *Me–You Principle* discussed in Section 3. This is unproblematic, as most simulation theorists—including Goldman—acknowledge that simulation requires background theoretical knowledge. The threat of collapse concerns the act of simulation, which occurs in the T2–T3 transition. Does the simulation that moves Vincent from T2 to T3 require the possession of tacit psychological knowledge?

In the example above, the T2–T3 transition reflects Vincent's tacit knowledge of the principle of disjunction elimination: A v B, B, → A. This is not a psychological principle, but a logical one. That is, T2 and T3 offer the logical form of thoughts about the world, and the tacit knowledge involved in the T2–T3 transition is knowledge about the logical relations between claims of this form. Since process-driven simulation stays viable so long as the actual process of simulating—the transition from T2 to T3—is made without the use of any psychological theory, there is no collapse. The T2 to T3 transition is devoid of psychological theorizing; there is no appeal to mental states. As they explain, "this [attribution of knowledge of the principle of disjunction elimination] is quite different from tacit knowledge of the principle that people typically reason in accordance with the rule" (2001: 172, fn. 117). So while simulation may require knowledge of a tacit principle, it is not a tacit *psychological* principle. And it is the utilization of tacit psychological principles that is required for simulation to collapse into a form of theory–theory. The threat, Davies and Stone conclude, has been avoided.

Before responding to Davies and Stone's argument, I want to pause and consider the significance of the strategy they have adopted. Davies and Stone rescue simulation not by denying that it avoids appeal to tacit knowledge, but by claiming that the tacit knowledge it invokes is non-psychological. They are thus willing to allow that simulation involves tacit theoretical knowledge. This save undercuts Goldman's motivation for positing process-driven simulation, specifically his claim that it is more economical than theory–theory because of its avoidance of theoretical principles. Thus, even if Davies and Stone's argument succeeds, Goldman and other proponents of the simulation theory may find it a cold comfort.

5.2. The save collapses

Davies and Stone (2001) are correct that a tacit, non-psychological theory could avoid Heal's threatened collapse. They are wrong, however, to view Goldman's process-driven simulation in this way. Or so I shall argue. My argument against their conclusion hinges on the nature of the tacit knowledge involved in the T2–T3 transition. Davies and Stone argue that this transition will always be between logical formulations of contents about the world, and so will not include any information about the mental states of the person being simulated. In what follows, I show that this claim is not warranted on Goldman's model of process-driven simulation, nor is it a convincing claim in its own right.

Davies and Stone's construal of the T2–T3 transition conflicts with Goldman's own. Goldman offers a diagrammatic model of a simulation routine. It begins with the information about what the person to be simulated believes and desires. Then, the simulator pretends that these are her own beliefs and desires, inputting them into her practical reasoning mechanism and generating a pretend decision output. Finally, this pretend decision is then attributed—as a real (non-pretend) decision—to the target being simulated. Goldman claims that the practical reasoning mechanism responsible for carrying out process-driven simulation is one that "normally takes genuine (non-pretend) desires and beliefs as inputs, and outputs a genuine (non-pretend) decision" (2006, p. 49). In his diagrams of the simulation view, Goldman represents different mental states with different shapes (e.g., squares for desires, ovals for beliefs, and so on) and his depictions of simulation clearly show these various shapes serving as input to the simulation process (p. 29–30). Thus, Goldman's simulator uses both beliefs and desires as inputs for the practical reasoning mechanism. In attempt to strip the simulation inputs of their psychological content, Davies and Stone have misrepresented Goldman's position. If there is a view of simulation that avoids this threat of collapse, it is not Goldman's.

What's more, Goldman's view is unlikely to be the only account of simulation to experience collapse. No view of simulation can be as Davies and Stone describe and succeed as a characterization of our everyday practice of mindreading. Simulation requires the inclusion of mental state ascriptions. When simulating, it is not essential that I keep track of whose states are whose. In fact, simulation is supposed to involve taking on the states of another *as one's own* and then asking, "What would *I* do?"[15] But this does not mean that the inputs to the simulation are simply facts about the world, stripped of all mental predicates. While simulating I must keep track of what types of mental states are attached to the inputs I am imaginatively entertaining. Otherwise, my predictions will be prone to error, if not impossible to complete.

To see this point, consider the sorts of prediction that are commonly at issue in mindreading. Say that Vincent is again predicting Yvonne's beliefs and actions. Vincent knows that Yvonne has a standing desire to visit the zoo, and a conditional belief that if it is sunny, then she will go to the zoo. He also knows that she believes that it is currently sunny outside. Vincent inputs this information about Yvonne's mental states into his own practical reasoning mechanism as a set of hypothetical beliefs and desires. The simulation yields the conclusion that he, under those circumstances, would go to the zoo. And so he predicts that Yvonne will (most likely) go to the zoo. Vincent only arrives at this conclusion if he keeps track of which of these inputs are of which mental state type. Starting from a simulation that involves Yvonne's *desire* that it be sunny yields a different prediction than one that begins from her *belief* that it is sunny. Failure to distinguish the two would lead to massive errors in mindreading, the sort that we easily avoid in our everyday use of this ability. This is a rather oversimplified example. In real cases of prediction we are often entertaining complex combinations of several different psychological states, including states beyond the propositional attitudes that Goldman urges us to consider. Thus, any further consideration of what mindreading requires will only make this claim stronger.

Davies and Stone's assertion that the tacit knowledge involved in simulations is non-psychological is in conflict with the way practical reasoning works. Mindreading requires more than information about the world; it also requires information about minds. To characterize the ability otherwise is to lose sight of the distinction between reasoning and using one's ability to reason in the process of mindreading. Without this distinction we lose sight of what is thought to be unique about this ability: the way in which it involves taking an individual's perspective on the world into account when predicting how she will act or explaining why she acted in the way that she did.

It is true that a lot, perhaps even most, of the items that go into our practical reasoning are claims about the world, or they are at least beliefs that the world is a particular way. However, such claims do not represent the entirety of the states involved in decision-making. Practical reasoning can also involve input about one's other psychological states, desires, hopes, fears, and the like, and how such states help to pick out and distinguish between the relevant factual beliefs. A sub-component of practical reasoning may deal exclusively with factual beliefs; Goldman calls such a module the factual-reasoning center. However, this processing will only be a part of what takes place in simulation and thus will not explain the T2–T3 transition in its entirety.

---

[15] Heal has suggested otherwise, worrying about instances in which one might "lose grip on the distinction between [her]self and others" (1994, p. 136). But it is hard to understand how simulation could account for the difference between asking *what would I do if I were X?* and *what would X do if she were me?* In fact, the simulation view gathers its plausibility from the idea that one's own reasoning mechanisms can be used in a general fashion to entertain what anyone would do given a certain initial set of beliefs and desires.

It could be objected that there are other ways of explaining the relation between the tacit knowledge attribution and the representations involved in the mindreading system. That is, the tacit knowledge could consist in what the representations are *about* rather than what *explains* the transitions between representations, as I argued in the last section.[16] Perhaps this account of representation would allow Davies and Stone's (2001) account to withstand my objection by making the representations of the simulator be thoughts about the world. In the zoo example, Davis and Stone could say that, during the simulation process, Vincent's tacit theory is really about a relationship between sunny days and zoo visiting, not about anything going on in Yvonne's mind. If Vincent wants to simulate weather patterns, then such representations would work well.

This reformulation will not save simulation from collapse. In the case under consideration, Vincent wants to simulate Yvonne's state of mind. His interest in the relation between sunny days and zoo visiting is parasitic upon his interest in how Yvonne thinks about these things. Any representations he employs in the simulation process will have to be representations of Yvonne's psychological states. Without her perspective, the general knowledge is ineffective. Critical to the characterization of this ability as mindreading is the sensitivity of this ability to *minds*. This alternative account of representation fails to prevent the collapse of simulation.

Others have used Davies and Stone's argument as the basis for generating hybrid accounts of mindreading, which appeal to both theory and simulation.[17] Perner and Kühberger (2005) offer such a view. They argue that simulation is used in cases where we lack an available theory and simply model the world with an analogous system. In creating this hybrid, Perner and Kühberger rely explicitly on the distinction provided by Davies and Stone, wherein the difference between theory and simulation involves whether the tacit knowledge is psychological.

Perner and Kühberger's account is but one example.[18] Such hybrid views offer interesting, and even plausible, accounts of the nature of mindreading, but they misunderstand the implications of collapse. The threat of collapse challenges the credibility of the distinction between theory and simulation. If the threat succeeds, as I have argued it does, then theory and simulation are not alternative accounts of how mindreading occurs. Mindreading may involve a variety of processes, as hybrid views urge us to consider, but each process makes use of a tacit psychological theory. As Wringe explains the result of collapse, "any aspect of our mentalising which can be accounted for by reference to our possession of a capacity to simulate can *ipso facto* be accounted for by reference to our possession of a theory" (2009, p. 226). The implications of collapse thus apply to all attempts to distinguish between theory and simulation, whether they are drawn *between* accounts of mindreading or *within* a single account.

6. Responding to the collapse

Although Davies and Stone were unable to save Goldman's simulation view from collapse into a variant of theory–theory, there may be other ways of responding that could prevent, or at least mitigate, the collapse. In this section, I consider three. First, Goldman himself may have a way of responding to the collapse that threatens his view. Second, one could avoid collapse by rejecting the account of tacit knowledge by which it is achieved, an approach suggested by Currie and Ravenscroft (2002). Third, one could concede collapse, but claim victory for simulation on other grounds. Wringe (2009) advocates a version of this final strategy, suggesting that simulation may be preferable to other forms of theory–theory because of the explanatory depth it provides.

In what follows, I argue that neither of the first two strategies will be able to prevent the collapse of simulation into theory. Both recommend jettisoning the Evans–Davies account of tacit knowledge, but do so without suggesting an alternative. Leaving the mindreading debate without an account of tacit knowledge, I will show, does more harm than good. Finally, I suggest that Wringe's acknowledgment of simulation's explanatory virtues is interesting, but applies to other (non-simulation) views of mindreading as well.

6.1. Goldman's response

Goldman's own discussion of the threat of collapse goes little beyond the points made by Davies and Stone. In fact, Goldman claims that Davies and Stone have rejected Heal's account of tacit knowledge (2006, p. 55–56). Davies and Stone do offer a refinement of Heal's proposal—emphasizing restrictions on what kinds of systems can be credited with tacit knowledge—but in doing so they continue to assert that there is a viable account of tacit knowledge and that Goldman appeals to it. As I noted in Section 5.1, their argumentative strategy involves granting Heal her desired conclusion, albeit in conditional form: *if* the states used in simulation involve systematic transitions between psychological representations, then simulation is tacit knowledge of a psychological theory. Their key move is to argue against collapse by showing that the tacit knowledge to which Goldman appeals is non-psychological. As we now see, this save cannot work: for Goldman, the transitions involved in simulation are psychological.

Ultimately, Goldman rests his rejection of the collapse on the supposedly obvious distinction between theory and simulation:

---

[16] I am grateful to William Ramsey for this suggestion. The account of representation proposed is what he terms S-representation (2007, p. 77–92).
[17] Wringe (2009) calls these "mixed views."
[18] Others include Carruthers (1996) and Stich and Nichols (2003).

On the surface, there is a tolerably clear contrast between (mere) theory and simulation. In light of the contrast, it is prima facie implausible that evidence for a simulation routine should also and equally be evidence for a theory routine. Thus, any account of tacit knowledge that implies that the occurrence of a simulation entails the possession of a tacitly known theory is prima facie implausible and should be resisted (2006, p. 56).

Goldman's insistence on a "tolerably clear contrast" between theory and simulation involves a faulty characterization of theory–theory as requiring lawlike generalizations (p. 28). As discussed in Section 2, Stich and Nichols (2003) make no such requirement. Further, this response fails to acknowledge the challenge that the threat of collapse poses to simulation: the threat comes about precisely because the distinction between theory and simulation is not clear.

Most importantly, Goldman has the issue turned around. What needs to be established is that there is a distinction between the accounts of mindreading offered by simulation theory and theory–theory, such than an account of tacit psychological knowledge would be differentially related to each of them. To simply declare that such a distinction exists, and then challenge any account of tacit knowledge to meet it, is to move in the wrong direction. Goldman has not managed to save his account of simulation from collapse.[19]

One might resist this claim by suggesting I have begged the question against Goldman. Why does the burden for reconciling simulation with theories of tacit knowledge fall to proponents of simulation and not to those advocating theory–theory? The claim may seem especially unfair, considering that theory–theorists have not said much about tacit knowledge either. I concede that both sides have work to do in this regard, but I do not consider this demand on Goldman, and other simulationists, to be unreasonable. The request emerges from the dialectic structure of the debate over the nature of mindreading. While theory–theorists have not done much to connect their account of tacit theory to the Evans–Davies proposal, they have advanced the theory–theory approach against the background assumption that such a proposal is available. Simulation, in contrast, emerged as an *alternative* to the dominant, theory–theory view. It earns a spot on the list of candidate characterizations of this ability only insofar as it is reasonably distinct from other views already in play.

6.2. Rejecting the Evans–Davies account

One could continue to press the point on Goldman's behalf, by rejecting the Evans–Davies account of tacit knowledge via which the collapse is achieved. Currie and Ravenscroft (2002) suggest this response to Heal's alleged demonstration of simulation's collapse into tacit theory, stating: "this result is more apt to be taken as a refutation of the theory of tacit knowledge from which it is derived than a serious objection to simulationism" (2002, p. 58).

If simulationists respond in this way, it would prevent the collapse of simulation into theory, but it would hinder the study of mindreading in at least two respects. First, this move would push the debate backward rather than forward. One needs a principled reason to reject the Evans–Davies account of tacit knowledge, and none—other than distaste for its implications—has been given. At the very least, an alternative account of tacit knowledge should be proposed and should be shown to have distinct advantages over its rival. In the absence of such a viable alternative, it is unclear that anything would be gained by this rejection. To dismiss the Evans–Davies account of tacit knowledge simply to perpetuate the contrast between theory and simulation is to privilege the debate over its resolution.

Second, and more importantly, the Evans–Davies account offers an important advantage for the study of mindreading. Specifically, it offers a way of determining—empirically—which of two (or more) alternative tacit theories is the one actually being used by the person to whom the tacit knowledge is attributed.[20] That is, it suggests a strategy by which various accounts of mindreading can be investigated in psychology and neuroscience. Recall the mirroring constraint discussed in Section 4.1. This constraint, as given by the Evans–Davies account, stipulates a tight match between the inferential structure of the theory and the causal-explanatory structure of the knower. Davies' uses the example of the letter–sound correspondence rules that are tacitly known by those who can read a given language. The account he gives is rather generic, stating what would have to be the case to establish the existence of a rule of the form "all words that start with *d* should be pronounced /D/." This example works fine for his purpose of illustrating the account of tacit knowledge. In psycholinguistics, researchers push the issue further, designing experiments that tease apart similar spelling-to-sound translation rules. By giving people sets of plausible nonwords to pronounce (e.g., items like *gebful* and *gebic*), for example, researchers can determine which tacit theory

---

[19] In fact, it may be one of the virtues of Goldman's (2006) account that encourages the collapse. Goldman is critical of theory-theory accounts, in part, because of their focus on propositional attitudes like belief and desire. He urges that we look for a more "comprehensive account of mindreading" (2006, p. 20) that can account for other mental states (emotions, feelings, etc.) as well, and he intends simulation as just such an account. By using one's own decision-making capacities, Goldman insists that the simulator enjoys broad access to a range of mental states. Given that Goldman's account is directed toward increasing the number of mental states that are inputted into one's subpersonal mechanisms for simulation, it seems unlikely that he would welcome a rescue of his account that involved stripping the inputs to simulation from their mental predication as Davies and Stone (2001) propose.

[20] Technically, Evans (1985) initial proposal offers a way of distinguishing a structured tacit theory from a non-structured tacit theory. Davies' modifications to the account allow for ways of differentiating between alternatively structured tacit theories.

of spelling-sound relations best matches a speaker's performance.[21]

The same method is at work in empirical studies of mindreading. Since the creation of the false belief task (Wimmer & Perner, 1983), psychologists have been designing experiments to test when the ability to mindread emerges and how the ability should best be characterized. The resulting literature is immense, and the debates are ongoing. Review of these studies would require far more space than I have available here. Even though the nature of mindreading unsettled, the empirical methods used to investigate this question suggest at least implicit appeal to the Evans–Davies view of tacit knowledge: the knowledge being attributed to the mindreader must match the causal–explanatory structure exhibited by her responses. To abandon the Evans–Davies account of tacit knowledge would be to drive a wedge between the philosophical and empirical approaches to mindreading, which up until now have been complementary.

6.3. Simulation's explanatory depth

Wringe (2009) suggests a more modest victory for simulation. He concedes the threat of collapse—simulation is a version of theory–theory—but argues that, nonetheless, simulation may be preferable to other accounts of mindreading because it offers the most explanatory depth. This claim is intriguing, and is consistent with what I have argued thus far. My rejection of Davies and Stone's attempted save of simulation shows that Goldman's account of process-driven simulation, and accounts of simulation more generally, collapse into views of mindreading via appeal to tacit, theoretical knowledge of psychological states. But nothing in what I have argued suggests that simulation collapses into a particular version of theory–theory already on offer, nor have I shown that Goldman's view is false. Indeed, Goldman's view could turn out to best amongst the alternatives, although all options on the table are versions of theory–theory.

Does simulation have more explanatory depth than theory–theory? Wringe characterizes depth as an explanatory virtue captured by the following principle:

Asymmetry: Of two alternative true explanations, *A* and *B* of a phenomenon *P*, where *A* is true in virtue of the truth of *B*, while *B* is not true in virtue of the truth of *A*, *B* has the greater explanatory depth (2009, p. 228).

Wringe argues that this asymmetry principle reveals the explanatory strengths that simulation has over theory. Vindication of simulation (B) as the true account of mindreading would show theory–theory (A) to be true, but the reverse does not hold. Vindication of theory–theory would not thereby confirm the truth of simulation. Simulation thus has more depth than theory.

There are reasons to be concerned with Wringe's asymmetry principle, as it seems to capture cases of both explanatory *depth* and explanatory *breadth*. That is, the asymmetry principle will privilege explanations of the *B*-type when they offer more low-level detail than those of the *A*-type (depth), but it will also privilege *B*-type explanations that apply to a broader range of cases than those of the *A*-type (breadth).[22] For now, we can set these concerns aside and simply ask whether simulation and theory fit the asymmetry principle in the way Wringe has proposed.

If theory–theory is understood generically, in the way that Stich and Nichols (2003) recommend, then it appears that simulation does indeed have more depth than theory–theory. After all, there are many different types of tacit psychological theory that would reveal the Stich and Nichols' account to be the right one, but only one that would vindicate Goldman's. But, as I noted in Section 2.1, there are many other versions of theory–theory on offer. Both Fodor (1987) and Botterill (1996), for example, offer specific—and distinct—characterizations of the tacit psychological theory that mindreading involves. If either of these accounts were shown to be the correct one, then they would also have more depth than theory–theory broadly construed. Thus, simulation seems to earn its depth not by the focus on simulation *per se*, but by providing a level of detail that comes along with the focus on simulation.

Prior to knowing which of these accounts of mindreading is the right one, speculations about this (or any other) explanatory virtue are premature. The asymmetry principle can only be employed when making comparisons between two alternative *true* explanations.[23] In the debate over the nature of mindreading, we are still in search of a single, true explanation. My hope is that conceding the collapse of sim-

---

[21] For example, Treiman and Kessler (2006) use this framework to argue that the sound-to-spelling rules used in reading are best characterized as statistical regularities. Words like *gebic* and *gebful* are interesting because 'g' has both a hard and a soft pronunciation. The hard pronunciation, /g/, is found in words derived from Latin, whereas the soft pronunciation, /dʒ/, comes from words incorporated into English from Romance languages (and so tends to occur proceeding vowels such as 'e', 'i', or 'y'). Most literate English speakers are not aware of the origins of English spelling, much less the differences in pronunciation associated with the roots of words. And yet, when tested on nonwords like those above, their performance showed sensitivity to the distinction between Latinate and Romance roots. Treiman and Kessler thus conclude that the sound-to-spelling rules (tacitly) known by speakers of English are sensitive to roots and context. This conclusion reveals implicit endorsement of the mirroring constraint.

[22] This ambiguity can be seen in the non-mindreading examples Wringe provides. The first is an explanation of a particular instance of finding a colleague is out of her office. In this case, he proposes that the fact that it is a national holiday (B) has more explanatory depth than the fact that her car is not parked in the usual spot (A). The second is an explanation of why a round peg will not find into a square hole. Here the geometric explanation (A) is characterized as having less depth than the explanation of the electrostatic particles of the peg and hole (B). The former appears, at least to me, to be a case of breadth, whereas the latter is one of depth.

[23] Wringe is sensitive to this point, as revealed in the following statement of his claim: "the simulationist explanation of our capacity to ascribe folk psychological states is – if true – deeper, and thus better than the theory theorist's account" (2009, p. 229).

ulation into theory, as I have urged here, will accelerate the search. There are many issues left to resolve, but their resolution will come from within the theory–theory framework, not from a debate between theory and simulation.

7. Conclusion

In this paper I have argued that Goldman's view of process-driven simulation collapses into an account of mindreading as tacit psychological knowledge, and that the collapse has implications for other simulation and hybrid views as well. The study of mindreading is an interdisciplinary pursuit, connecting research programs in philosophy, developmental psychology, comparative ethology, neuroscience, psychiatry, and many others. The articulation of simulation and theory views has shaped the nature of research programs in these other areas. Recasting the terms of the debate as I suggest could influence how research in these other areas proceeds, and may illuminate possible strategies for identifying, once and for all, the nature of mindreading.

Acknowledgements

References

Baron-Cohen, S. (1995). *Mindblindness*. Cambridge, MA: MIT Press.

Botterill, G. (1996). Folk psychology and theoretical status. In P. Carruthers & P. K. Smith (Eds.), *Theories of theories of mind* (pp. 105–119). Cambridge, UK: Cambridge University Press.

Carruthers, P. (1996). Simulation and self-knowledge: A defense of theory-theory. In P. Carruthers & P. K. Smith (Eds.), *Theories of theories of mind* (pp. 22–38). Cambridge, UK: Cambridge University Press.

Carruthers, P. (2006). *The architecture of the mind*. Oxford, UK: Oxford University Press.

Currie, G., & Ravenscroft, I. (2002). *Recreative minds: imagination in philosophy and psychology*. Oxford, UK: Oxford University Press.

Davies, M. (1987). Tacit knowledge and semantic theory. Can a 5% differences matter? *Mind, 96*, 441–462.

Davies, M. (1989). Tacit knowledge and subdoxastic states. In A. George (Ed.), *Reflections on Chomsky*. New York, NY: Blackwell.

Davies, M. (1995). Two notions of implicit rules. *Philosophical Perspectives, 9*, 153–183.

Davies, M., & Stone, T. (2001). Mental simulation, tacit theory, and the threat of collapse. *Philosophical Topics, 29*, 127–173.

Dennett, D. (1987). *The intentional stance*. Cambridge, MA: MIT Press.

Evans, G. (1985). Semantic theory and tacit knowledge. In G. Evans Collected (Ed.), *Papers*. Oxford, UK: Clarendon Press.

Fodor, J. (1987). *Psychosemantics*. Cambridge, MA: MIT Press.

Fodor, J. (1992). A theory of the child's theory of mind. *Cognition, 44*, 283–296.

Goldman, A. I. (1989). Interpretation psychologized. *Mind and Language, 4*, 161–185, Reprinted in M. Davies & T. Stone (Eds.), Folk psychology: The theory of mind debate, Oxford, UK: Blackwell Publishers, 1995..

Goldman, A. I. (2006). *Simulating minds: The philosophy, psychology, and neuroscience of mindreading*. Oxford, UK: Oxford University Press.

Gordon, R. (1986). Folk psychology as simulation. Mind and Language, 1, 158–171. Reprinted in M. Davies & T. Stone (Eds.), Folk psychology: The theory of mind debate, Oxford, UK: Blackwell Publishers, 1995.

Gordon, R. (1995). Simulation without introspection or inference from me to you. In T. Stone & M. Davies (Eds.), *Mental simulation: Evaluations and applications*. Oxford, UK: Blackwell.

Gordon, R. (2008). Beyond mindreading. *Philosophical Explorations, 11*, 219–222.

Harris, P. (1989). *Children and emotion*. Oxford, UK: Blackwell Publishers.

Heal, J. (1986). Replication and functionalism. In J. Butterfield (Ed.), *Language, mind, and logic*. Cambridge, UK: Cambridge University Press.

Heal, J. (1994). Simulation vs. theory-theory: What's at issue? In C. Peacocke (Ed.), *Objectivity, simulation, and the unity of consciousness*. Oxford, UK: Oxford University Press.

Heal, J. (1998). Co-cognition and off-line simulation. *Mind and Language, 13*, 477–498.

Heal, J. (2003). *Mind, reason, and imagination: Selected essays in philosophy of mind and language*. Cambridge, UK: Cambridge University Press.

Jackson, F. (1999). All that can be at issue in the theory-theory simulation debate. *Philosophical Papers, 28*, 77–96.

Jackson, F. (2000). Psychological explanation and implicit theory. *Philosophical Explorations, 1*, 83–95.

Kripke, S. (1982). *Wittgenstein on rules and private language: An elementary exposition*. Cambridge, MA: Harvard University Press.

Mitchell, J. P. (2005). The false dichotomy between simulation and theory-theory: The argument's error. *TRENDS in Cognitive Sciences, 9*, 363–364.

Morton, A. (1980). *Frames of mind: Constraints on the common sense conception of the mental*. Oxford, UK: Oxford University Press.

Nichols, S. (2002). Folk psychology. In L. Nadel (Ed.), *Encyclopedia of cognitive science*. London, UK: Nature Publishing Group.

Peacocke, C. (1994). The issues and their further development. In C. Peacocke (Ed.), Objectivity, simulation, and the unity of consciousness (pp. xi–xxvi). Oxford, UK: Oxford University Press.

Perner, J. (1991). *Understanding the representational mind*. Cambridge, MA: MIT Press.

Perner, J., & Kühberger, A. (2005). Mental simulation: royal road to other minds? In B. F. Malle & S. D. Hodges (Eds.), *Other minds: How humans bridge the divide between self and others* (pp. 174–189). New York, NY: Guilford Press.

Polanyi, M. (1966). *The tacit dimension*. New York, NY: Doubleday Press.

Quine, W. V. O. (1972). Methodological reflections on current linguistic theory. In D. Davidson & G. Harman (Eds.), *Semantics of natural language*. Dodrecht: Reidel.

Ramsey, W. (2007). *Representation reconsidered*. Cambridge, UK: Cambridge University Press.

Sellars, W. (1956). Empiricism and the philosophy of mind. In K. Gunderson (Ed.), *Minnesota studies in the philosophy of science* (pp. 253–329). Minneapolis, MN: University of Minnesota Press.

Stich, S., & Nichols, S. (1995). Folk psychology: simulation or tacit theory? In M. Davies & T. Stone (Eds.), *Folk psychology*. Oxford, UK: Blackwell.

Stich, S., & Nichols, S. (2003). *Mindreading: An integrated account of pretence, self-awareness, and understanding other minds*. Oxford, UK: Clarendon.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition, 13*, 103–128.

Wright, C. (1986). Theories of meaning and speaker's knowledge. In C. Wright Realism (Ed.), *Meaning, and truth*. Oxford, UK: Blackwell.

Wringe, B. (2009). Simulation, theory and collapse. *Erkenntnis, 71*, 223–232.