

# **Social Systems**

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It used to be thought that folk psychology is the only game in town. Focusing merely on what people *do* will not allow you to predict what they are likely to do next. For that, you must consider their beliefs, desires, intentions, etc. Recent evidence from developmental psychology and fMRI studies indicates that this conclusion was premature. We parse motion in an environment as behavior of a particular type, and behavior thus construed can feature in systematizations that we know. Building on the view that folk psychological knowledge is knowledge of theoretical models, I argue that social knowledge is best understood as lying on a continuum between behavioral and full-blown psychological models. Between the two extremes, we have what I call 'social models'. Social models represent social structures in terms of their overall purpose and circumscribe individuals' roles within them. These models help us predict what others will do or plan what we should do without providing information about what agents think or want. Thinking about social knowledge this way gives us a more nuanced picture of what capacities are engaged in social planning and interaction, and gives us a better tool with which to think about the social knowledge of animals and young children.

## **1. Introduction**

Our ability to think of others in terms of their psychological states is known as folk psychology. Theory theorists argue that this ability is to be understood in terms of knowledge of something like a theory (Stich & Nichols 1995, Gopnik & Wellman 1990), whereas simulationists maintain that it consists in being able to imagine being in someone else's position whilst deploying counterfactual reasoning and decision-making abilities (Gordon 1995, Goldman 1989). Both views maintain that the source of our social interactive abilities is our psychological understanding. We are able to interact with each other the way we are because we can predict what people are going to do, and we are able to do that because we have the capacity to think of them in terms of what they want, think, and feel. For instance, I decide to get tickets for us to see *Two Towers* because I know that you like action movies and you know that I like fairy tales, and I know that we both want to see a movie.

In this paper, I argue that it not necessary to ascribe beliefs, desires, intentions, etc. to people in order to interact with them in optimal and socially appropriate ways; we often rely on

other sources of knowledge—knowledge that does not impute mental representations to agents—for such interaction. In addition to thinking of action as the result of the interaction of mental representational states, we systematize behavior in terms of goals and simple perceptual states or in terms of the actor’s role in a social structure or relationship. Such systematizations, I suggest, are best understood as theoretical models (Maibom 2003, Godfrey-Smith 2004). Our social knowledge, then, should be understood as consisting minimally in knowledge of models of behavior, social models, and folk psychological models. Each model can be applied on its own, and each provides a distinctive perspective on behavior. Often, these models supplement one another. When deployed together, they yield a fuller picture of human behavior. Such fuller understanding, however, is not required for planning how to interact with others, nor is it always attainable prior to deciding what to do (Morton 2003).

In section 2., I argue that we see animate motion in terms of behavior, and that we are able to systematize such behavior, together with extensionally defined goals and simple perceptions to predict and explain what organisms do. In section 3., I argue that we have knowledge of social structures, institutions, and relations, which is to be understood differently from knowledge of behavioral regularities and mental representations. I also introduce the notion of a model, and argue that social knowledge consists of knowledge of models of behavior, social models, and folk psychological models. In section 4., I show how knowledge of these three types of models interacts. I conclude by pointing to the advantages of accepting this view of our social ability over other, more traditional, ones.

## 2. Models of Behavior

The indispensability of knowledge of representational mental states in social interactions is best expressed by Jerry Fodor (1987, 9): ‘If you want to know what generalizations subsume a behavioral event, you have to know what *action type* it belongs to; knowing what *motion type* it belongs to usually doesn’t buy anything.’ Knowing what movement someone makes gives us little, if any, predictive and explanatory purchase. It does us no good to know that someone lifted her hand and shook it from side to side; it helps knowing that she waved. But to understand what action type a motion falls under, we must speculate about the agent’s intentions or her beliefs and desires.<sup>1</sup> Intentions, beliefs, and desires are representational mental states or compounds of such states; intention usually understood as consisting of a belief and a desire. According to Fodor, someone has a belief or desire if she stands in some relation to a mental representation (17). For instance, someone believes that it is raining if she stands in some relation to the mental representation ‘it is raining’. Generalizations over representational mental states subsume actions and tell us what beliefs and desires typically give rise to them; they are indispensable for human interaction: (1987, 8)

We have, in practice, no alternative to the vocabulary of commonsense psychological explanation; we have no other way of describing our behaviors and their causes if we want our behaviors and their causes to be subsumed by any counterfactual-supporting generalizations that we know about.

‘Reaching for the butter’, ‘picking apples’, and ‘asking for directions’ are all irreducibly psychological expressions insofar as there are no non-psychological properties that all and only those actions share (8). If this is right, it follows that in order to understand a motion as an action, one must understand something about the psychological properties that are essential to typing it as an action: one must have an understanding of what representational mental states would give rise to the action in question.

Fodor’s argument constitutes a case in favor of the practical indispensability of folk psychology against eliminativism (Churchland 1981). Classifying behavior in terms of motion

types is hopeless for behavior explanation and prediction because motions of different types can instantiate the same type of action, and actions of different types can be instantiated by the same type of motion. Nevertheless, psychologists have provided evidence that it is possible to classify behavior by its motion properties *relative to the environment* and that behavior so typed can figure in predictions (Gergely et al. 1995). The developmental literature, therefore, more or less agree that the ability to generalize over behavior does not require understanding behavior as being produced, in the right way, by representational mental states. Whereas it has been suggested (Povinelli 2001) that this ability remains operative in adults and accounts for some of their social ability, the more common approach is to assume that it develops into full-blown folk psychological understanding (Csibra & Gergely 1998, Scholl & Tremoulet 2000, Tomasello 2005). In this section and the next, I argue that predictions and explanations of behavior sufficient for much social interaction require knowledge only of systematizations of behavior, understood as goal-directed motion. We do not need to see behavior as action and, consequently, in terms of what representational mental states caused it. It is sufficient that we think of organisms as behaving in goal-directed ways, having goals, and standing in perception-like relationships to their environment. Returning to Fodor, the different motion types that are subsumed under one action type are usually also subsumed under one behavior (understood as goal-directed motion) type, and the type of motion that can instantiate different action types can also instantiate different behavior types. This is sufficient for systematic thinking about behavior of the kind that we engage in.

The evidence relevant to this idea of behavior individuation comes from studies of so-called perceptual animacy (Scholl & Tremoulet 2000). If presented with a display in which simple shapes (e.g. circles and squares) move at certain speeds and in certain relations to one another, adults report that the objects are behaving intentionally and are also prone to ascribe psychological states to them. Fritz Heider and Marianne Simmel (1944) famously found that subjects described objects as chasing and escaping one another, wanting to get somewhere, and so on. Infants are sensitive to the same kinds of motion patterns that adults think of as actions.

They distinguish purposeful motion from mere physical or mechanical motion, and type instances of the former by reference to their endpoint or goal (Gergely et al. 1995, Scholl & Tremoulet 2000). The variables that determine such classification include the speed with which the object is moving, the degree to which it changes trajectory, the relation between its movements and objects in the environment, and its orientation with respect of the direction of movement.<sup>2</sup> Typically, it is its relation to other objects in the environment that helps type the behavior as having a particular aim. On this basis, children form expectations about the objects' future behavior. It is therefore tempting to conclude that understanding that objects move in a purposeful way involves understanding that they do what they do because of what they intend, think, or want. There are, however, reasons to doubt such an interpretation. Young children and many apes are able to parse behavior quite well although it is doubtful that they understand representational mental states.

The literature on the development of so-called theory of mind suggests that children do not possess an understanding of representational psychological states until around the age of three and a half. Children famously do not pass the false belief task until that age (Wimmer & Perner 1983). They insist that people's beliefs correspond to the way the world is. For instance, if they gather new information that falsifies their beliefs that there are pencils in the Smarties box, they avow that they thought there were pencils in the Smarties box all along, even though they earlier claimed that there were Smarties in it. On the desire front, Betty Repacholi and Alison Gopnik (1997) have shown that children do not understand that people can desire objects that others do not until they are about 18 months old. Nevertheless children are capable of forming expectations about the movement of objects and the behaviors of agents before this age (Gergely et al. 1995, Onishi & Baillargeon 2005). This suggests that understanding beliefs and desires is not necessary for individuating behavior in a way that ultimately can sustain predictions and explanations (via generalizations or, as I shall argue later, models).

A big literature has sprung up around the false belief task, in part because it is so puzzling. Children, at the age when they fail the task, have rather sophisticated social abilities.

They engage in pretend-play (Leslie 1987), use information about what someone believes to predict what they will do, as long as the belief is not false (Wellman 1990); they imitate intended movements but not accidental ones (Meltzoff 1995, Carpenter et al. 1998), segment motion into goal-directed units (Baird & Baldwin 2001), and form expectations about the goal-directedness of motions given properties of the object (Woodward 1998) or properties of the motion (Premack 1990, Csibra et al. 1999). More recently, Kristine Onishi and Renée Baillargeon (2005) showed that 15-month-old infants form expectations about where an agent will look for an object that are sensitive to two constraints: whether the object is moved and whether the agent is present when it is moved. On the basis of infant successes like these, it has been suggested that children have an understanding of representational mental states already at an early age, but that the performance mechanisms that allow them to attribute such states correctly in false belief scenarios develop later (Fodor 1992, Onishi & Baillargeon 2005). Such performance mechanisms might simply amount to the ability to inhibit a prepotent response to fill in someone's belief content with an aspect of the world as known to the infant (Scholl & Leslie 1999).

Performance shortcoming accounts have advantages, but they must explain why children are not able to do what they are otherwise able to do in the context of belief attribution. Gopnik (1993) has shown that memory limitations do not explain early failure on the false belief task, verbal difficulty is not sufficient to explain the problem (Ruffman & Perner 2005), and the idea that children cannot suppress a prepotent response to attribute belief contents that correspond to reality makes sense of only some of the data. It explains why infant looking times support a preverbal early understanding of false belief, but not why this knowledge does not manifest itself in other ways until the child reaches the age, where she passes the false belief task (Ruffman & Perner 2005). One might therefore ask: is it reasonable to suppose that *a* understands that *B* is *P*, if *a* interacts with *B* in many cases as if *B* were not *P*? The answer seems to be no. And there is a relatively straightforward way in which young children interact with beliefs in the false belief task, insofar as they base their predictions of future actions on the beliefs of the agent, and they provide answers based on their understanding of the word 'belief'. Since we are not demanding

that the child *extend* the application of her understanding to new, uncharted territory, the best explanation does, indeed, seem to be that children does not yet understand representational psychological states does not appear until 3-4 years of age.<sup>3</sup> This has the further advantage that it accords with neuroimaging data (see below).

If children do not understand beliefs and desires at the age when they are able to respond in a relatively sophisticated manner to behavior, how should we think of their understanding? Although they do not have a full-blooded notion of intentional action, they must have at least some idea of a goal. ‘Goal’, as I propose to use it, is a teleological concept. Having a goal usually involves either standing in a relation to an object, as when *b* chases *c*, or to some state of affairs, as when plants move their leaves to capture more sunlight. The movement of the leaves is goal-directed, but not intentional. Put differently, we might say that the notion of a goal is extensional, referring as it does to a relation between an organism and an object or a feature of the environment (Bermúdez 2003b, 173). Consequently, thinking of something as having a goal does not require attributing to it a representational mental state (Csibra & Gergely 1998). Similarly, behavior as goal-directed movement is not the same as action. To understand the former, you need only represent extensional relations between the organism and features of or objects in the environment. Goal-directed motion differs from other movements by being parsed according to the goal of the moving object, not according to its trajectory or topography. Behavior thus conceived—neither as intentional nor as mere movement, but as goal-directed—can figure in generalizations that give predictive and explanatory purchase on the behavior of animals, humans included. In short, we can understand infant’s social abilities can in terms of an ability to generalize over goals and behaviors. The understanding of behavior itself should be understood as relatively primitive; it is the result of a perceptual animacy system or module.

The proposed interpretation of children’s competence with action individuation is supported by functional neuroimaging studies. Rebecca Saxe (2006) has found that a specific region of the temporo-parietal junction is specifically activated by tasks involving thinking about representational mental states. When thinking about a person’s movements in terms of their

goals, a distinct area in the posterior superior temporal sulcus is activated. This indicates that the capacity to individuate goal-directed behavior and make predictions on the basis of it is different from the ability to reason about representational mental states.<sup>4</sup> This conclusion is further reinforced by thinking about the capacities of non-human social animals, e.g. monkeys and apes. Such animals are clearly able to pick out actions in terms of their goals and respond appropriately given their situation and interests. There is little temptation to think that they therefore possess anything like knowledge of representational psychological states. This conclusion echoes Daniel Povinelli's (2001), who has suggested that a low-level system representing behavioral regularities operates at least in chimpanzees and humans and is responsible for gaze following, perceptual animacy, and so on. Povinelli, however, believes that this low-level system works *purely* on behavioral regularities and does not involve such categories as seeing and hearing (Povinelli 2001). Recent evidence suggests otherwise (Hare et al. 2000, Santos et al. 2006).

That systematizations of behavior are sensitive not just to organisms' goals, but also to their perceptions—provided that perception is understood as a relational property between the organism and the environment—is clear from Onishi & Baillargeon's (2005) work with infants, Laurie Santos and colleagues' work with rhesus monkeys (Flombaum & Santos 2005, Lyons & Santos 2006, Santos et al. 2006), and Michael Tomasello and colleagues' work with chimpanzees (Hare et al. 2001, Tomasello et al. 2003, Tomasello et al. 2005). Children's expectations concerning what an agent will do are sensitive to what they know about the agent's perception; rhesus monkeys and chimpanzees understand that others can see and hear, and modify their behavior accordingly. Nevertheless, chimpanzees repeatedly fail tests meant to explore their understanding of representational mental states (Povinelli 2001, Tomasello et al. 2005). There is no evidence that their social understanding extends to thinking about others in terms of such states. Such perceptual understanding, then, is understanding of 'simple seeing', not of 'epistemic seeing' (Dretske 1969, 2000). When someone ascribes simple seeing to someone, their ascriptions take nonpropositional contents. What makes the ascription true is the

direct perceptual relation between the person to whom the perception is ascribed and an object.<sup>5</sup> Ascriptions of epistemic seeing, on the other hand, take propositional contents, which are opaque, which raises the possibility that the organism might, in a sense, falsely see something (it looked to me as if...). Such ascriptions are made true by an *epistemic* relation between the organism and the object or the environment, wherefore making them requires an understanding of mental representations. Perceiving is, of course, much more than seeing, but I shall assume that it can be understood using the distinction between ‘simple’ and ‘epistemic’ kinds of seeing. You can understand simple perception without understanding mental representations (Bermúdez 2003b).

It is now possible to see how infants form expectations about behavior without ascribing to them understanding of mental representations. However, to establish that part of our social ability consists in knowledge of regularities of simple perceiving, behavior (as goal-directed motion), and goals, I must argue i) that the abilities in question are to be understood in terms of the possession of knowledge about regularities, and not simply as perceptual-motor knowledge, and ii) that adults actually deploy knowledge about goal-directed behavior once they have acquired knowledge of representational psychological states. Concerning the last point, we already know that many evolutionarily old systems continue to operate in us despite the fact that we have also developed newer systems; the fear system is a case in point (LeDoux 1994). It is therefore quite plausible that we share this behavior individuation capacity with our closest relatives (Andrews 2000).<sup>6</sup> There is also evidence that some people who have sustained damage to their frontal lobes do not spontaneously anthropomorphize on the Heider & Simmel task, indicating they have impaired perceptual animacy. Nevertheless, their ability to think of people in terms of their beliefs and desires remains intact (Heberlein & Adolphs 2004). As the neuroimaging data was collected from adults, this strongly indicates that the area of the brain dedicated to thinking about representational mental states is not engaged when thinking about goal-directed behavior (Saxe 2006).

With an explanation of point (ii) at hand, we are left with point (i). Should we explain the abilities in question in terms of possessing knowledge of regularities and not simply in terms of perceptual-motor knowledge? What I have said so far can be seen as deflating previously over-intellectualized abilities. Ironically, however, it can itself be seen as an over-intellectualization since presumably a range of the social behaviors of animals—humans included—can be understood more simply in terms of capacities to react to certain perceptions. Consider returning someone's smile. This may be little more than a rote reaction, even though we can easily rationalize the action in terms of being polite in responding to someone's friendliness, or something of that sort. The question is whether we can extend this way of thinking about social behavior to account for appropriate reactions to goal-directed behavior. And here we have reasons to doubt that a simple perceptual-motor construal will do the job. Laurie Santos and colleagues (Flombaum & Santos 2005, Santos et al. 2006) have shown that rhesus monkeys have a good understanding what another agent can and cannot hear and see, and that this understanding plays an important role in modifying their behavior. In particular, monkeys prefer to steal food from humans when the humans cannot see or hear them doing so. The knowledge that is brought to bear here appears to involve manipulable representations of agents seeing their food being taken and goal-directed behaviors that they can engage in to get it back. Of course, some socially appropriate responses may be little more than motor-perceptual capacities of the sort just mentioned.

There have recently been some interesting speculations about the role of language in cognition that would make predictions similar to mine as to what non-linguistic creatures can and cannot understand about other organisms. José Bermúdez (2003b) suggests that higher-order thought (thought about thoughts) is only possible for linguistic creatures, and Peter Carruthers (2002) claims that non-domain specific, non-modular thought is constituted by linguistic structures. Proposals like these would explain why there would be different levels of social understanding, one involving just representations of behavior, goals, and mere perception. Since

I regard the ability to systematize—what I shall argue is an ability to construct and deploy theoretical models—to be domain-general, my proposal is only compatible with Bermúdez’s.

I do not propose to reduce social understanding to understanding models of behavior, but I want to suggest that there are levels of descriptions of behavior supporting knowledge structures that help enable social interaction, not all of which are psychological. The fact that there are many levels of description of behavior is, I take it, old news (Davidson 1980). The level that we choose allows for different ways of thinking about the agent; he turns on the light because it is dark, or he alerts a prowler to scare him off. We do not always need to know why people do as they do in order to be able to coordinate our behavior with theirs (Andrews 2000, Morton 2003). If I know that Harry always has lunch at the Faculty Club, I know that if I want to talk to him, I can go to there at lunchtime. I do not need to know *why* he always has lunch there.

### **3. Social Models**

Knowledge of behavioral regularities is clearly useful, but without an understanding of social structures, we cannot engage with others in the highly structured way that is characteristic of humans. If I haggle with a merchant at the market, I need to know something about conventions of exchange; knowing what goal-directed movements he will perform when certain observable features of the environment are thus-and-so, or what he will typically do when he sees me move thus-and-so, won’t do the trick. Here, too, it has been suggested that much human interaction is explicable in terms of knowledge *not* organized around concepts of representational mental states. Bermúdez (2003a, 2005) suggests that much of social interaction is enabled by knowledge of scripts and heuristics that exploit purely behavioral regularities. His idea is not that we can do without knowledge of representational psychological states altogether, but rather that the extent to which such knowledge plays a role in social interaction has been greatly exaggerated. In what follows, I discuss scripts and heuristics and their shortcomings (Schank & Abelson 1977, Gigerenzer 2000), introduce the notion of a theoretical model, and argue that social understanding generally is better understood in terms of knowledge of models than knowledge of

generalizations, scripts, or heuristics. Finally, I argue that although these models introduce conceptual structures that go beyond behavioral features (*contra* Bermúdez), they do not feature representations of representational mental states.

To highlight how successful social interaction may be the result of deploying knowledge not about mental representations, but about categories of behavior, Bermúdez (2003a, 2005) uses the iterated prisoner's dilemma. A typical type of prisoner's dilemma is a game featuring two players, who have two moves available to them: cooperate or defect. If they both cooperate, they will receive a payoff of, say, \$6. If, however, one person cooperates, but the other does not, the cooperator gets \$2 and the defector \$8, and if they both defect, they each get \$4. When choosing whether to cooperate or defect, each prisoner knows nothing of the other's decision. In a one-shot prisoner's dilemma, it does not really matter what the other person does, because whatever it is, it is always in one's best interest to defect. But once you reiterate the game in an open-ended manner, and you make the results of each game available to the players, the optimal approach need no longer be defection. Moves can reflect what happened in earlier games; cooperation can be rewarded by future cooperation, and defection punished. As such, it matters a great deal to your decision-making what the other person intends to do which, in its turn, partly depends on what *you* intend to do. In the words of Robert Axelrod (1984, 14): "no best rule exists independently of the strategy being used by the other player."

Deciding whether to cooperate or defect is highly complex if it involves ascriptions of mental representations to the other player, e.g. a prediction of what they have decided to do. However, one of the most stable and successful strategies for playing reiterated prisoner's dilemmas makes no reference to the players' beliefs, desires, or intentions; it simply recommends a course of action based on the players' course of action. The so-called TIT-FOR-TAT strategy simply says: 'start out cooperating and then mirror your partner's move for each successive move' (Axelrod 1984).<sup>7</sup> Bermúdez proposes that something like this approach can be used as an alternative to the more laborious process of psychological ascription. Such heuristics can be characterized non-psychologically in terms of moves (behavior) to coordinate our

behavior with that of others, without us having to consider their *reasons*. Such procedurally organized knowledge structures he calls heuristics.

Adam Morton (1996, 2003) is skeptical about the viability of using of folk psychological ascriptions in social cooperation problems. For consider, if I am to decide what to do by predicting what you will do, but if what you will do is a function of what you think I will do which, again, is a function of what I think you will do, my decision relies on extremely complex reasoning when it can be made at all. The more complex the embeddings, the more difficult people find such reasoning, making it likely that people simply do not have the computational resources to engage in the sort of reasoning required. There is the additional difficulty that sometimes no solution will be found taking this route, since I cannot determine what my partner will do without first having determined what I will do. Consequently, Morton favors so-called solution-based approaches to social cooperation problems (Morton 2003). Cooperation problems can, and often are, solved by agents searching for an equilibrium, defined as a choice of “an action, which is part of a combination in which no one can do better by unilaterally choosing differently” (2003, 5). Solution-based approaches require not psychological ascriptions, but the ability to represent possible situations, choices, choices as being optimal, and outcomes of choices, along with the attendant counterfactual reasoning skills. Some choices may be relatively simple—the equal division of food, e.g.—and some more complex.

Let us return to Bermúdez. In addition to heuristics, such as TIT-FOR-TAT, he suggests that we may deploy more complex information structures; structures that, again, do not refer to mental representations. An example of such knowledge would be knowledge of a script. A script specifies the purpose of some activity, the various role-players, and a sequence of permissible and/or obligatory moves. Commonly, scripts have sequential orderings of moves, as is clear in Schank & Abelson’s (1977) famous restaurant script. The purpose of going to a restaurant is to eat. Role-players include at least a client, a cook, and a server. The sequence of moves is as follows. In scene one, the client enters the restaurant, finds a table, and sits down. In the following scene, the server gives the client the menu, the client looks at it, decides what to order,

and gives the server her order. The scenes unfold until the client has paid and left the establishment. There are variations – in fast food restaurants, the client orders at the counter, in nicer restaurants, the server gives the client a table, and so on. But knowledge of this script is supposed to be sufficient for someone to understand stories about restaurants and, given the relevant performance mechanisms, for engaging in appropriate social interaction.

The problem with scripts is well known. Programming a computer with detailed scripts is not sufficient for it to perform at the level of people in providing answers to everyday questions. Herbert Dreyfus (1997) has famously argued that what is inevitably lost in complex programs for computers are the physicality and experience of being in the world that organisms have. Everyday knowledge requires everyday experience not just of the environment, but also of moving around and manipulating objects in it. Heuristics, though being more procedural than scripts, won't quite solve the problem because the more procedural you make a cognitive structure, the more you lose out on the ability to manipulate the information contained in it. Heuristics tell us what to *do* under certain circumstances without telling us much about how the structure works, what its purpose is, etc. Our social knowledge allows us to act appropriately and predict what others will do, it is normative in nature (this is how people in these roles *ought* to act), and contains at least the rudiments of some understanding of the structure. Although we may have knowledge of heuristics, it is unlikely to account for very much of our social ability.

If heuristics are too procedural and scripts lack the lived-in quality of knowledge of the world, how are we to think of social knowledge? I suggest we think of it as knowledge of theoretical models (Giere 1988, Maibom 2003). Such knowledge is necessary *but not sufficient* for the production of complex social behavior. We should, I think, take a charge like Dreyfus's to heart and acknowledge that an important part of our knowledge is implicit in our ability to live in, move in, and manipulate the world around us. There is much motor-knowledge that appears to be stored in motor-programs, whose informational content is not accessible to consciousness and that cannot be integrated with other information in the cognitive system (Stich 1978). These informational structures may serve in the application of knowledge of theoretical models.

Theoretical models are used everywhere in science. In philosophy of science, they either supplement or supplant the idea that scientific theories are bodies of universal generalizations or laws (Suppes 1960, Suppe 1989, Giere 1988). Theoretical models are sets of objects with relations, properties, and functions defined over them. A two-particle Newtonian system with an inverse square force is an example of a model (Giere 1988). It consists of two objects: two particles, whose properties include mass, position relative to time, and velocity, but not extension. These particles are related in terms of the force that each exerts on the other. A function— $F=Gm_1m_2/d^2$ —defines the force operating on the particles. Conceived of at this level of abstraction, a two-particle Newtonian system with an inverse square force does not represent any actual system in the world. Models are best understood as abstract objects in their own right. To represent real-world state of affairs, they must be supplemented by so-called theoretical hypotheses, specifying the respects in which and degree to which they fit the world. For instance, the Earth-Moon system approximates a two-particle Newtonian system with an inverse square force to a high degree of approximation with respect of the position and velocities of the objects. This is despite the fact that both the Earth and the Moon are massive bodies that have considerable spatial extension. Although these bodies' masses are not uniform, they can be treated as such for the purposes at hand (degree of fit), and their shape or structure are irrelevant to calculating their positions and velocities (respect of fit). Substantial work, then, goes into the hypotheses when it comes to *what* the models represent.

Peter Godfrey-Smith (2004) and I (Maibom 2003) have argued that folk psychological knowledge is best understood in terms of knowledge of theoretical models. People represent families of folk psychological models and hypotheses, although I do not think theoretical hypotheses should be understood as being explicitly represented. Experts gain a certain facility with fitting models to the world, and such facility is likely to be largely a matter of procedural knowledge. The lived quality of our everyday knowledge may be located in such knowledge, e.g. motor-programs. Folk psychological models are models of individuals and their mental representations. These models are, broadly speaking, of three kinds: one is concerned with how

the combined actions of objects contained in a larger one causes the actions of this latter object, another concerns the actions of these contained objects, and the third concerns how internal object come to be as a result of states and event outside the container object. The container-object, which is also an actor, is the individual, and the contained objects are beliefs, desires, epistemic perceptions, emotions, and intentions, all contained within the larger object of the agent. In a classical model, a desire for something combines with a belief concerning how to bring that something about, causing the agent to act in accordance with the belief about how to bring about the desired state of affairs. The two objects—the belief and the desire—are related to each other by being combined, and they, in turn, are related to a property of the agent—her action—in terms of them causing it. Other kinds of folk psychological models concern the interactions between beliefs, desires, etc. and interactions between external events and states and perceptions and knowledge. Models such as these are extremely powerful although their deployment is limited. Real-world agents have multitudes of desires and beliefs, and the abovementioned classical model is only appropriately used if no other beliefs or desires are relevant. As such, folk psychological models are no different from physical models; Io and Jupiter cannot be understood as a two-particle Newtonian system with an inverse square force because of the interference of Jupiter's other satellites, e.g. Ganymede and Europa.

If instead of thinking about the knowledge structures discussed above as scripts and heuristics, we think of them as models, we are not in the sticky position of having to explain how programming a computer with the relevant information is not sufficient to make it respond to questioning as ordinary humans. If the hypotheses that help us apply the models to real-world systems are implicit and procedural, we can allow for the lived quality of ordinary knowledge.<sup>8</sup> Social models are models of social structures and institutions and the individuals within them. Here individuals occupy roles, and the way that they interact with others is a function of their role and the role of the other person(s). Whereas there may be ways of understanding the individual actions of persons as having a certain purpose or goal, a full understanding of what they do includes the purpose of the structure or institution itself. By contrast to folk

psychological models, where what has a purpose also acts, in these models social structures and institutions usually do not act. It is the individuals within the structure that act. What they do, however, is a function of the purpose of the structure or institution and how it is organized. In a way, the logic of social models is the inverse of that of folk psychological models. In the latter, the main actor, the agent, acts as a function of his beliefs and desires (etc.). In social models, the main actors act as a function of the larger structure of which they form part.

Consider how people behave in restaurants. What the person who waits on guests does, he does *qua* waiter; his desire to take somebody's order is a function of him seeing himself as a waiter, and is quite independent of his personal desires and preferences generally. When, perusing the menu, the other person sees him approaching, she infers that he is coming to take her order, but to do so she need only understand that that this is what waiters do with customers, and that he is a waiter and she is a customer. What he, personally, desires is irrelevant to the customer's prediction of what he will do and what she ought to do and *vice versa*. Of course, you must both be able to understand each other's utterances. I propose to leave linguistic understanding to the side, although it must be stressed that this is ultimately quite relevant to a complete picture of social understanding. My proposal is that all that being able to act appropriately in a restaurant requires—apart from some linguistic competence—is knowledge of restaurant models (formerly scripts) along with the ability to apply them. You must understand your role, the role of the other agent(s) and the structure you partake in, which specifies required and permissible moves. You can then let this determine your interactions *ceteris paribus*. It is not knowledge of the thoughts and desires of the waiter, cook, and owner that allows you to understand what goes on in restaurants.

The distinction between social models and folk psychological models should be relatively clear. Folk psychological models are organized around the individual, social models around a social structure or institution. The latter usually involves more than one person, where the former features no more than one. In a folk psychological model, the way an agent acts is a function of her beliefs and desires, whereas in a social model her actions is a function of both her position in

the structure and the position of the other party. If the function of a school is to impart knowledge of various aspects of the world and to inculcate certain skills, like reading and writing, various agents must play their proper roles: the students must learn and the teachers teach. To be able to understand this and to be able to do the best thing in such a context, one need not think about the thoughts, desires, etc. of the various agents. Teachers give assignments to measure what the students have learnt. What they *want* is neither here nor there. This is what teachers do! Compare: Santa Claus climbs down the chimney with presents. We all indulge this myth without the slightest concern about what Santa wants, feels, or thinks. I am, of course, not suggesting that teachers *only* interact with their students in ways prescribed by their knowledge of social models, but that much of what teachers and students do can be understood without thinking about their beliefs or desires. The same goes for interactions within other social structures, like hospitals, government offices, and riding schools. Social models even help circumscribe interactions within socially sanctioned relationships. A marriage model consisting of at least two persons (usually of opposite sex), with functions (mutual exchange of favors, including material goods, time, care, sex, and child rearing) defined over their union, helps us understand what we get into when we marry and how we must act towards our spouse.

Whereas social models, as I see them, do not impute mental representations, as such, to individual actors, there is a question whether users of such knowledge nevertheless must possess concepts of mental representations and be able to deploy folk psychological models. As I hinted above, if linguistic competence requires knowledge of folk psychological models, then appropriate linguistic interaction *does* require use of such models. A more pressing concern is whether the notion of purpose, as reflected in the purpose of social structures and institutions, can be understood without falling back on mental representations.

The first thing to note is that although it makes sense to talk of an institution or organization as an agent that, consequently, can have purposes, intentions, and plans (French 1979), this is not how the social models I have talked about are organized. In these models, the social structure or institution has a purpose, but does not itself act. Individuals occupying roles in

the structure act. Their actions are understood against the background of the larger structure; i.e. what that structure is *for*. Frameworks that regard organizations as agent do not regard their purposes as what they are *for*, but as elements that make us understand what they *do*; indeed, they are really just folk psychological models applied to organizations rather than persons. To understand the purpose of a social structure, then, is to understand what it is *for*, not what it intends to do. Knowledge of social models requires at least some knowledge of function. The function of social structures is different, in interesting ways, from the function of artifacts. Where one *uses* artifacts according to their function, one *occupies a role* in a social structure with a function. The actions of each individual in a structure are part of the structure fulfilling its function. Ordinarily understanding what a social structure is for does not allow one to *use* it, like understanding what a knife is for allows one to use it; rather it makes it possible for one to carry out the actions that will enable it to satisfy its function.

Understanding social purposes in this way also sets social models apart from the systematizations discussed in section I. They do not operate at the level of behavior, goals, and mere perception. Systematizations such as these are often thought of as generalizations, but I suggest they are better thought of as models too (in part because everyday systematizing is well understood as model-building). Models of behavior are organized around organisms in an environment. A model of chasing, e.g., contains two organisms where one—the hunter—has the goal of catching the other—the prey—that has the goal of avoiding being caught. The success of the hunter is a function of it being able to perceive where the prey is and being able to move sufficiently fast, whereas the success of the prey is a function of it being able to perceive where the hunter is and moving away from it sufficiently fast. This model fits a real-world system as that of a dog chasing a cat to a high degree with respect of perception, goal, and behavior, but is silent about the physical characteristics of the organisms, the means by which they propel themselves, and so on. Clearly, social models are not models of behavior, but purposes also cannot be understood as goals. A goal is a purely extensional relation holding between an

organism and some object in or feature of the environment. What social structures are *for* cannot be understood in purely in such terms.

TIT-FOR-TAT, of course, does not clearly have a purpose, and we may have to ascribe some mental representations to others or ourselves in order to conceptualize certain moves as cooperation or defection. As a matter of fact, I do not think TIT-FOR-TAT should be understood as a strategy that people actually use as opposed to a model of decision or game theory, nor is it clear that Bermúdez intended it this way. Instead, people may use a number of models that are of the TIT-FOR-TAT kind, e.g. invite x for dinner, if x invites *you* for dinner, then invite x back for dinner, and so on (see also Morton 2003). These models may be hybrid models to the extent that they borrow their concepts from folk psychological models or models of behavior. Models of social relations, too, may be hybrid in this sense, since they are not clearly *for* something; being in them are more like an end in itself. Even so, both they and TIT-FOR-TAT style models operate in quite distinct ways from models that explicitly impute psychological properties to people and are used for their predictive purchase in making decisions about social interactions. And if being in certain relationships is *generative* of projects, even if some of those can be understood simply as goals, models of such relationships include elements that are notably absent from models of behavior. Assuming that Morton is right that solutions to prisoner's dilemma type scenarios aim at equilibria, the focus on what would be a satisfactory outcome for someone *else* is also an important difference from models of behavior.

Construing social knowledge in part in terms of knowledge of social models has a couple of advantages. Since models fit the world to a larger or lesser extent, people may disagree about *how* they fit. Some might regard models merely as useful tools, others as actually reflecting underlying structures in the world (Godfrey-Smith 2004). This explains why people have such different attitudes towards the reality of social structures and relations. It also accounts for substantial variation among individuals in how to apply the knowledge they have. Another advantage is that social models can serve both a productive and a cognitive function. They help us understand, explain, and predict other's actions, and help us figure out how we should act.

Folk psychological knowledge, as traditionally conceived, only serves the understanding. Jane Heal (1994) has argued that dividing social information that is relevant to figuring out what others will do from social information about what we ought to do is uneconomical. It saddles us with two largely overlapping bodies of knowledge. We have one body of information telling us what people usually do, and another telling us what we ought to do. But since folk psychological theory is a theory of *us*, we might expect it and decision making procedures to be more closely related. Of course, it seems odd to suppose that we decide to act as we do simply because this is what people usually do. One solution is to accept that folk psychological knowledge does not consist in a body of information about what people tend to do, but in our ability to make decisions and imagine being in others' position. This is the simulationist approach (Heal 1994, Davies & Stone 1998). Another way to solve this problem is to suppose that at least part of our knowledge is of social models, as I have just described them. Social models help us understand what people are doing under a relevant description (e.g. 'he's taking my order'), explain why they did what they did (e.g. 'waiters take orders'), predict what they are going to do next (e.g. 'he'll give the cook the order') *and* help us figure out what we should do (e.g. 'wait for my dinner to arrive'). Since the hypotheses involved in the application of models to real-world social interactions might be embodied, e.g. consist in motor-programs, social models likely contain less detail than scripts. We are not in need of a worked out sequential ordering of moves, if we rely on experience to add to our ability to *apply* the models.

A question remains. If we know we have models of behavior and folk psychological models, why should we complicate the matter by introducing social models too? Morton's observation of the difficulties ascribing mental representations to others in reiterated prisoner's dilemma type situations answers this question in part. Many forms of social interaction and coordination would be impossibly cumbersome were we first to predict what others think, feel, want, or intend. In general, we should not underestimate the difficulties involved in figuring out what people believe, desire, and so on. When beliefs and desires are not obvious—e.g. a woman standing in a room with a chair believes that she is standing in a room with a chair—or people do

not tell us about them, they can be remarkably hard to come by. If we were to figure out what to do with a doctor without knowing anything about the institution of medicine, our folk psychological models would be hard pressed to do the work. We have already seen that at least some social models operate with a conceptual structure—that of the purpose of a social structure or institution—that is not derivable from the concepts deployed in behavioral models or folk psychological ones. The fact that facility with folk psychological models and models of behavior do not suffice for many forms of social interaction is, I think, sufficient to show that there is a distinctive type of model for social structures and institutions.

#### **4. Model Interaction**

What has emerged is a picture of social ability consisting in knowledge of models of behavior, social structures, and psychological states, and the ability to apply them to real-world phenomena. In a wide range of social situations, we do not have to know what others think, feel, or want to interact with them sensibly. We use folk psychological models in complex situations, e.g. for understanding Iago's actions in *Othello*; in our more intimate relationships, where we care not just about the way people act, but also about *why* they act as they do; and in self-reflections, when we try to gauge our own motives and feelings. Folk psychological models are indispensable for making sense of the *full* range of human social interaction, although what we need to know in order to interact sensibly with others need be no thicker than what people usually do when such-and-such occurs.

The three types of models can be used separately. Since each focuses on a different aspect of subjects and what they do—how an organism relates to its environment, what internal events causes an action, or the role that a subject plays in a social structure—they each provide a different understanding of the situation. Imagine seeing John putting boxes of apples outside a store. We can understand him as doing so because the shop is about to open, using something like a model of behavior. John is engaged in some activity that he always engages in, in relation to the event of the shop opening. The explanatory and predictive power of applying such a model

might be limited, but it has its uses. I can also understand what John is doing as fulfilling his duty as a store clerk. This opens up a broader range of expectations connected with him being a clerk. I might, for instance, expect him to perform other functions including being of help to me if I shop where he works. I understand what he does as the result of him playing a role in a larger scheme, as it were. If I apply folk psychological models, this won't add much to an understanding of his putting apples out, but it will open up a new perspective on him. That perspective will no doubt include what he does and the social context in which he does it, but extend beyond this. It might include concerns about why he decided to become a clerk, what his other ambitions are, and so on.

Some events are best understood using only models of behavior; a shark chasing a seal, say. Others can be understood, albeit in a different way, using any of the three types of models. Which model to use is not independent of what sort of understanding is sought. If we are trying to figure out how to act in prisoner's dilemma style situations or how to act in a particular social setting, social models are often best, as I argued in the last section. Consider an everyday transaction like paying for gas at the gas station. When I enter to pay, folk psychological models are not particularly useful in helping me figure out how to interact with the store attendant. Imagine that after having handed him my credit card, he hands me a slip without saying anything. I know that people usually want to do what they do, so I can be pretty certain that he wants me to have the slip. I might also attribute to him the belief that by producing that motion, he is giving me the slip. Even with all this information, I am not in a particularly good position to figure out what to do next. This is *not* because I have inferred beliefs and desires that are irrelevant to the situation, but because without the requisite knowledge of credit card interactions, I cannot frame his behavior at the level of description that is useful for me to figure out what *I* should do. But whereas I will have difficulties figuring out what to do without acquiring knowledge of a relevant social model, I can get by without the application of folk psychological models.

In many cases, different types of models complement one another. Used together, they

give a fuller understanding of a person and her actions. Imagine that you are in a café with a friend discussing common acquaintances. You know that Sally left Harry, but not why. You ask: ‘why did Sally leave Harry?’ To which your friend replies: ‘because he was seeing another woman’. You might use a social model to understand the situation, or you might use a folk psychological one. The social model lets you know that Harry has violated an arrangement with Sally (marital sexual fidelity) and, as a consequence, the form of relationship they entered into has broken down. Sally’s decision to leave Harry is perfectly understandable. The folk psychological model helps you see that Sally is heart-broken knowing that Harry has been unfaithful, she has lost her trust in him, and she no longer wants to continue her relationship with him. Each form of explanation leaves something important out. It is hard to see why Sally finds Harry’s sleeping with other people so upsetting that she leaves him without understanding the institution of marriage. In other times and cultures, Sally would be unlikely to leave Harry no matter how upset his infidelity made her. Although Sally might find Harry’s infidelity intrinsically heartrending, the fact that he is her husband makes his infidelity much more than that. Conversely, if we are merely focusing on the marriage arrangement, we leave out an understanding of Sally’s feelings. And God forbid we should ask our friend whether Sally knew about Harry’s philandering or whether she minded!

Sometimes the different types of model mutually constrain one another. To fully understand Sally’s upset and hurt—which is indisputably a full-blooded psychological understanding—I must understand the institution of marriage. Likewise, knowing something about credit card interactions, I can easily ascribe to the gas station attendant the desire that I sign the credit card receipt. Knowledge of social models helps constrain the space of the possible beliefs and desires. Models, then, are rather flexibly applied. Sometimes, we can make do with just one type of model; at other times, we need several.

It is sometimes argued that many of our social explanations are shorthand for fully-fledged belief-desire explanations (Dennett 1987, Fodor 1987); ‘Anne didn’t come to the party because her husband was ill’ might be seen as a stand-in for a fuller explanation of Anne’s

actions in terms of how she feels, what she wants and thinks. Some even argue that explanations of behavior that do not make reference to psychological states be dismissed as not constituting explanations proper (Gopnik et al. 2000). The idea can be supported by the observation that someone presented with the above explanation might still ask whether Anne knew about her husband being ill and whether she wanted to tend to him. This might be taken to show that the explanation is incomplete. It is surely wrong, however. Even if most of us are disposed to retreat to folk psychological explanations when we consider behavior in detail, this means neither that explanations of behavior that do not make reference to representational psychological states fail to fully explain, nor that such explanations are shorthand for psychological ones. Indeed, our tendency to retreat to folk psychological explanations can in some cases be explained by certain behaviors being inexplicable in terms of models of behavior or social models (Bermúdez 2003a). It is naïve to think that explanation is independent of the explainer's projects and concerns (van Fraassen 1980). The different types of explanations that we find in the various sciences bear testimony to this fact (Cornwell 2004).

## **5. Conclusion**

I have argued that knowledge of people's representational mental states: their beliefs, desires, and feelings does not play quite the role in enabling social interaction as is sometimes assumed. We are often able to reason well about how to interact with others thinking merely of them in terms of what they are likely to do in that situation or what their role in the social context requires them to do. Our social ability consists at least in knowledge of models of behavior, social models, and folk psychological ones along with appropriate hypotheses about their application. Each type of model provides a different perspective on people and what they do. Nevertheless, they often supplement one another, jointly providing a fuller, more satisfying understanding of others. This paper has focused on models, but it should not be forgotten that for models to represent they must be supplemented with hypotheses, and these hypotheses are best understood as implicit, even embodied knowledge (motor programs). Representing real-world

phenomena as, e.g. being caused by beliefs and desires, involves *applying* a model in certain respects and to a certain degree. Knowledge of hypotheses has a lived quality to it, is not explicitly represented by the organism, but is nevertheless reflected in its behavior.

The picture of social ability presented here has advantages that the traditional picture does not. It shows the continuity between animal and human social cognition, thereby opening up new avenues of exploration of how the two compare. We have good reason to think that we share knowledge of models of behavior with many animals. Might we share knowledge of social models too? The proposed theory also offers a more parsimonious view of action planning. That there should be a closer connection between the two than has traditionally been thought was one of the insights of the simulationists (Heal 1994, Davies & Stone 1998). Whereas simulationists have based their account primarily on decision making processes or practical rationality, I have focused on social models. What it makes sense for us to do is highly restricted by social structures. Our situation in a social framework demands certain actions from us. Knowing this plays an invaluable role in guiding social interaction.

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*Notes:*

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<sup>1</sup> I use ‘desire’ broadly such as to cover all pro-attitudes.

<sup>2</sup> This is a simplification. There are a host of infant studies showing that infants are more likely to parse motion according to its goal if the moving object has human features, e.g. a hand, a face (Woodward 1998) or interact with it if it exhibits behavior contingent on the infant’s behavior (Johnson et al. 1998). This indicates that the mechanism that I’m focusing on here has many cousins. For simplicity, however, I shall focus on just this form of perceptual animacy. As long as these mechanisms operate to detect relatively simple features of objects—e.g. animacy—they do not affect the general line of argument.

<sup>3</sup> The Onishi & Baillargeon (2005) experiment is subject to the same account. Although this is one of the most ingenious ways of trying to determine the understanding of false beliefs in infants, there are simpler explanations available—in terms of connections between (mere) perceptions, goals, and behavior.

<sup>4</sup> Some question the conclusions Saxe draws on the basis of her data; cf. Mitchell (2005) and Saxe (2005).

<sup>5</sup> ‘Object’ here is used to cover “such disparate items as tables, houses, cats, people, games, sunsets, signals, tracks, shadows, flashes and specks. We see all these things and more.” (Dretske 2000, 98.)

<sup>6</sup> Addition sometimes involves overlap, but the overlap is usually partial. For instance, the two fear pathways that LeDoux has investigated are quite different. One is sensitive to cognitive information and can be molded by it in a way that the other cannot (LeDoux 1994). Similarly, there may be some overlap between perceptual animacy and the other social abilities that I will talk about.

<sup>7</sup> The success of TIT-FOR-TAT is relative to what other strategies it competes with. It is not always the optimal approach, and a simple defection can lead to a row of defections resulting in a poor outcome compared to competing strategies (Axelrod 1984). It is also worth noting that Robert Frank (1988) has collected some evidence that in when real people play these games, their assessment of their partner’s character does play a role in their decision-making.

<sup>8</sup> In his latest development of the idea, Bermúdez (2005) is more partial to understanding social knowledge in terms of frames that may involve patterns of behavior. This solves Dreyfus’s problem also. There are a number of interesting differences between a frame approach and a model approach, however. First, models don’t represent real-

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world systems *unless* they are supplemented with theoretical hypotheses. Second, models are abstract systems in their own right. And third, theoretical hypotheses are *generally* assumed to be implicit know-how (to apply) knowledge. To the extent that the model view has enjoyed success in the philosophy of science and, thus, has broader application to our knowledge of the world, I think the models approach is preferable to the frames approach. It also easily subsumes most forms of scripts.