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2.1 Imitation and Mind Reading: What Is the Connection?

Two of the most studied phenomena of the social mind are imitation and mind reading. What is the connection between the two, if any? It is not obvious that there is a substantial connection. Imitation is normally defined as some sort of behavior-behavior relationship, whereas mind reading is a mind-mind relationship. Nonetheless, there might be interesting connections between them. One of the phenomena might be a developmental precursor of the other; or proficiency at one task might enhance proficiency at the other. This could go in either direction; imitation might facilitate mind reading, or mind reading might facilitate imitation. A third possibility is that the two phenomena share a common cause; a single underlying process might underpin both imitation and mind reading. This chapter explores some of these possible connections.

2.2 Approaches to Mind Reading

Before turning to the imitation–mind reading connection, we should distinguish three different approaches to mind reading: the *rationality theory*, the *theory theory*, and the *simulation theory*. If there is an imitation–mind reading connection, its specific nature may well hinge on which of these approaches is correct. The so-called rationality approach has been championed by philosophers like Dennett (1987) and Davidson (1984). This approach says that ordinary people assume that their peers are rational and proceed to impute to them those desires and beliefs it would be rational of them to have in their circumstances. I know of no attempt by these or other rationality theorists, however, to draw a connection between imitation and mind reading.[1] Nor do I myself see any natural way of developing

1. See and cf. Gordon 2002 and vol. 2, ch. 3; Hurley, vol. 1, ch. 7. ED.

such a connection. So I will ignore the rationality theory and fix my attention on the two other major approaches: theory theory (TT) and simulation theory (ST). This chapter will not address the general debate between TT and ST. The discussion will be confined to links between imitation and mind reading that have been or might be proposed under the aegis of these theories. Relatively greater attention will be given to simulationism, both because I find ST a generally superior theory (Goldman, 1989, 1992a, 2000, 2001; Gallese & Goldman, 1998) and because the connections between imitation and mind reading seem more promising under ST than under TT.

Both TT and ST provide accounts of how ordinary people go about the business of attributing mental states. TT says that attributions of mental states, to both self and others, are guided by a commonsense psychological "theory." A theory, in a strict sense, is a body of propositions that includes (putative) laws or generalizations. Thus, a psychological theory is a body of propositions featuring psychological generalizations. If such generalizations are to be useful in predicting others' mental states, they must be intrapersonal, diachronic generalizations, specifying the transitions that a given psychological system will make from some initial states to successor states. According to TT, a mental attributor is like a scientist who approaches other people's minds—and her own—in the same way she approaches any system. She forms beliefs, or perhaps probability judgments, about the current state or condition of the target system. She extracts from her knowledge base some psychological generalizations and uses them to infer subsequent or prior states of the system. In the case of physics, the contents of a theorizer's beliefs are physical states of the system in question and generalizations about such states. In the case of mind reading, the contents of the attributor's beliefs are mental states and generalizations about mental states. Another feature of the TT approach concerns how the commonsense theory is learned. According to TT (at least the brand of TT of interest here), learning by infants has the same character as scientific learning; it proceeds by testing old theories against new evidence and sometimes creating new theories to replace old ones (Gopnik & Meltzoff, 1997; Wellman, 1990; Perner, 1991a).

What are the distinctive posits of ST? A prototypical mind-reading routine of the simulationist type has three main steps. First, the attributor creates in herself pretend states intended to match those of the target. In other words, the attributor attempts to put herself in the target's "mental shoes" (Gordon, 1986; Heal, 1986; Goldman, 1989). The kinds of mental states that can be pretended range across the mental spectrum and include perceptions, desires, beliefs, hopes, plans, sensations, and emotions. The second step is to feed these initial pretend states into some mechanism of the attributor's own psychology, e.g., a decision-making or emotion-generating mechanism, and allow that mechanism to operate on the pretend states so as to generate one or more new states. If the attributor wishes to predict a target's decision, for example, she might create pretend desires and beliefs (which she takes the target to have) and let her decision-making system operate on them so as to produce a (feigned) decision. Third, the attributor assigns the output state to the target as a state the target will undergo (or has already undergone). This three-step routine is the most full-blown simulation heuristic. There might also be shorter versions, however, such as a two-step routine. Here a pretend state is created in the attributor, who simply imputes that state to the target without feeding it into any mechanism for further processing. Clearly, the distinctive idea of ST is that mind reading is subserved by pretense and attempted replication. A mind reader adopts the mental "position" of the target and replicates (or attempts to replicate) mental activity appropriate to that position.

The chief contrast between ST and TT concerns the attributor's attempt to replicate mental states of the target, which includes the initial mental pretense. For ST this is a core part of mind reading; for (pure) TT, it plays no role whatever. According to TT, an attributor uses only descriptions of a target's states and psychological regularities. The attributor does not try to clothe herself in those very states, so as to mentally mimic or "impersonate" the target. All processing in the attributor is purely inferential processing, which moves from beliefs to other beliefs about the states of the target. TT posits no essential use of mental pretense by attributors.

2.3 Theory Theory, Imitation, and Mind Reading

Given these core ideas of TT and ST, let us now ask what stories each might tell about the connection between imitation and mind reading. I start with TT. An early suggestion of an imitation-mind reading connection was floated by Meltzoff and Gopnik (1993) and later pursued by Meltzoff with other collaborators. Since Meltzoff and Gopnik are leading theory theorists, one naturally expects their approach to follow TT contours, and this is realized to some extent in their paper. However, as I will argue, it is not easy to spell out their story so that it is fully compatible with the dominant themes of TT.

As background, recall that Meltzoff and Moore (1977, 1983a) discovered that infants as young as 42 minutes can display facial imitation. How can

they do this? How can they copy the facial expressions modeled before them? The tantalizing puzzle is that an infant of this age has never seen her own face nor correlated her outward facial expression with internally experienced movements. So how can she know which *felt* movements would match a facial expression *seen* in others? To explain the imitation ability, Meltzoff and Moore postulate an innate crossmodal (or supramodal) matching between visual perceptions of adult facial acts and proprioceptive information about their own acts. Given this matching, infants are said to understand, at some level, a correspondence between the self and the other.

A self–other correspondence is an important part of Meltzoff and Gopnik's story about imitation. In order for a commonsense psychology to get off the ground, they say, infants must make a basic distinction between persons and things. Imitation is supposed to be the infant's criterion for which things are persons. Persons are "entities that can be imitated and also who imitate me" (Meltzoff & Gopnik, 1993, p. 337). But what else does the infant associate with persons? If the ability to imitate and be imitated exhausts the infant's concept of a person, how does identifying something as a person constitute any progress toward folk psychologizing? Perhaps "persons" are antecedently understood as things that have, or are capable of having, mental states. How, then, does the infant know that what she imitates and what can imitate her is a person, i.e., the bearer of mental states? Perhaps Meltzoff and Gopnik mean to suggest that the mentality-imitability relationship is known innately. If so, this piece of innate knowledge is the main source of commonsense psychology, not what is yielded by imitation per se. Furthermore, even the conjunction of the propositions "Whatever is imitable has mental states" and "That thing is imitable" goes nowhere in helping the infant determine which *specific* mental states another person is in at a given time. Specific mental states, however, are clearly what mind readers seek to determine, and the way they make such determinations is what Meltzoff and Gopnik, like all theorists of mentalizing, should hope to explain.

Meltzoff and Gopnik marshall additional resources that might help provide such explanations. They posit innate knowledge of *specific* equivalences between external behavior and internal proprioceptive states or motor intentions. The infant's "starting-state" theory includes correspondences between the other's observed bodily movements and the infant's own experienced mental states. It is not immediately clear, however, how this knowledge can contribute to the assignment of specific mental states either to the self or to the other. Knowing which specific motor intentions

of mine can produce behavior that matches the behavior of another can explain how I can execute such a matching, but it does not address the question of how I can know, or infer, what mental states the other is in. Does it, perhaps, help me determine what my *own* mental states are? Knowing one of these correspondences would enable me to infer that *if* I match the other's behavior, then I must have had such-and-such a motor intention. But Meltzoff and Gopnik nowhere suggest that the value of imitation is that it helps one determine one's own mental states in this circuitous fashion. In fact, as we will soon see, Meltzoff elsewhere assumes that no such inference is necessary because one has direct knowledge of one's own states.

Meltzoff and Gopnik definitely contend that infants like to imitate and be imitated because they learn things from this activity, things relevant to their growing competence at folk psychology. They argue that imitation is used as a "discovery procedure" in human social development. But exactly how does imitation contribute to the child's development of competence in mind reading? I do not find a clear statement of such a contribution in their 1993 paper, but perhaps it can be found in later writings, especially by Meltzoff and others.

According to Meltzoff, when a child observes a creature that is *behaviorally* "like me," this prompts an inference that the other is also *mentally* "like me," using an analogical argument familiar to philosophers. Since the infant knows what she is mentally like in certain circumstances, this can help her identify the specific mental states of others under similar circumstances. Here are some passages articulating these ideas.

> Through experience [infants] may learn that when they act in particular ways, they themselves have certain concomitant internal states (proprioceptions, emotions, intentions, etc.). Having detected this regularity, infants have grounds for making the inference that when they see another person act in the same way that they do, the person has internal states similar to their own. (Meltzoff, 1999a, p. 390)

Similarly, Meltzoff and Moore write:

> This grasp of the other as like oneself . . . allows the infant to use the self as a framework for enriching its understanding of the other. Having done an action itself, the infant has subjective, experiential knowledge of that act [more precisely, of feelings associated with that act]. When the infant sees another perform an act that he knows is like his own, the infant can interpret the seen act in terms of this subjective experience. (Meltzoff & Moore, 1995, p. 65)

These passages suggest a sequence of inferential steps that might be spelled out as follows:

(1) When I act in way *w*, the action is preceded or accompanied by internal states *x*, *y*, and *z* (proprioceptive sensations, motor intentions, etc.).
(2) Therefore anyone who acts in way *w* will also experience internal states *x*, *y*, and *z*.
(3) This person now before me is acting in way *w*.
(4) Therefore he is now experiencing, or just experienced, internal states *x*, *y*, and *z*.

This formulation clarifies how an infant might apply a psychological law or regularity. Statement (2) articulates the sort of regularity in question. Notice, however, that this is a backward, or correlational, law rather than a forward law. It does not describe transitions from one state to a subsequent state of the system. Nonetheless, it may qualify as a folk-psychological law.

At least two problems may be raised, however, for this analogical approach to the child's thinking about folk psychology. The first is an epistemological problem that philosophers of mind have raised for the analogical approach. Epistemologically speaking, how solid is the inference from (1) to (2)? Can one reasonably project from one's own case to that of others? One's own case, after all, is but a single instance. Can a correlation between action and mental states in a single case really support an inductive inference to an analogous correlation for other people (or bodies), whose internal states cannot—perhaps even in principle—be verified in any other fashion? Although this problem is frequently posed in the philosophical literature, I will not press it. The mere fact that a style of inference is epistemologically problematic does not show that it is psychologically problematic. Infants might be programmed to perform a certain type of inference even if, from an epistemological standpoint, that type of inference is rather shaky. (Similar issues arise in connection with a language learner's "inference" to rules of grammar from a very restricted evidential base.) It is no criticism of a psychological hypothesis that it imputes to children, or even adults, a mode of inference that falls short of some ideal standard of epistemological rationality or justification.

A more serious problem for Meltzoff's approach concerns the status of proposition (1) rather than the inference from (1) to (2). The statement that the child knows (1) is premised on the assumption that she can have direct, experiential knowledge of her own mental states, in the present example, proprioceptive sensations or motor intentions. But how is this direct, experiential knowledge compatible with the TT approach? In fact, the TT approach to self-knowledge is sharply at variance with the postulation of direct knowledge. According to TT, knowledge of first-person mental states

strictly parallels knowledge of third-person mental states; both rely on theoretical inference (presumably from premises about behavior). This theoretical-inference approach is emphatically defended by Gopnik (1993), who maintains that people, including children, determine their own mental states in the same theory-driven way by which they determine the mental states of others, via inferences using folk-psychological laws. If this approach is carried through systematically, the child would first have to know (or believe) folk-psychological laws *before* she could determine her own mental states. Meltzoff's story, by contrast, assumes direct, noninferential knowledge of particular first-person mental states. Such direct knowledge is incompatible with a pure, undiluted, version of TT. So it seems to me that Meltzoff and Gopnik do not have an internally consistent *theory-theory* story of how imitation is connected with the development of mind reading.

It should be emphasized that my criticism of Meltzoff's way of connecting imitation to mind reading appeals to internal inconsistency, that is, its lack of consistency with a *pure* form of TT. I am not leveling a general critique of the direct access thesis. We should be skeptical, I think, of Meltzoff's application of such a thesis to young infants, but I do not urge a blanket rejection of all forms of direct access. However, a precise formulation of a tenable direct access thesis, one that includes all needed qualifications, is outside the scope of this chapter. It is worth remarking, moreover, that not all simulationists accept direct knowledge of one's own mental states. Simulation theory is primarily a theory about third-person mental-state attribution, and simulation theorists differ quite strongly on the question of self-knowledge, or self-attribution (e.g., contrast Gordon, 1996 with Goldman, 2000).

2.4 Perspective-Taking, Autism, and Imitation

I now turn to simulationist views of the imitation-mind reading connection. At least two different ST-related ideas have been floated about the imitation-mind reading connection. One says that a simulation-related phenomenon is at the root of imitation. This should not be interpreted as a claim that all imitation is guided by full-fledged mind reading. That would conflict with the fact that neonatal imitation ontogenetically precedes even primitive mind reading. The proposal is best interpreted as the weaker claim that simulational mechanisms guide at least some imitation as well as mind reading (at any rate, a good deal of mind reading, if not all of it). The second idea proposes a quite different connection between imitation

and mind reading, essentially reversing the direction of explanation. It says that imitation plays a pivotal role in the development of advanced mind reading, via mechanisms of a simulationist kind.

This section explores the first of these connections (corresponding to the third alternative mentioned in section 2.1). The idea is that mental simulation is a crucial mechanism for both imitation and mind reading. The principal driving force behind this idea consists in the evidence that autism is associated not only with a well-known deficit in mind reading but also a deficit in imitation. This suggests a common cause of these deficits, a dysfunction responsible for both of them. If the root of this dysfunction lies in simulational mechanisms, this would support the idea that there is an important connection between imitation and simulation-driven mind reading.

As explained in section 2.2, the fundamental idea of mental simulation is that mind readers go about their task by putting themselves, imaginatively, in a target's mental "shoes." Many writers speak of taking the other person's "perspective," where this can mean adopting either their specifically perceptual perspective or, more broadly, their nonperceptual perspective as well, e.g., their desires, beliefs, and other mental attitudes. Critical to ST is the idea that in trying to impute mental states to others, an attributor typically has to set aside her own actual mental states, including perceptual states, and substitute those of the target. If one has trouble executing these kinds of mental operations, one will have trouble with many mind-reading tasks. If it can be shown that the same type of subjects who have trouble with mind-reading tasks—as is well known of autistics—also have trouble with imitation tasks requiring perspective reversals, that would tend to support the claim that proficiencies in mind reading and in (certain aspects of) imitation have a certain common source. This is the theme of the present section.

It must be conceded that proponents of TT will deny that mental simulation is the only way of accounting for success or failure at perspective-taking. They would not readily cede this territory to ST. It is not part of this chapter's mission, however, to take up this issue between TT and ST. I only adduce the kind of evidence that advocates of ST have found, or are likely to find, congenial to their approach, without trying to settle the debate that might still be pursued by theory theorists.

DeMyer and colleagues (DeMyer et al., 1972) first described the difficulty that autistic children have with imitation. Another investigator who found imitation deficits in autism was Ohta (1987), whose findings hint at a simulational source. Ohta studied autistic children with an average chronological age of 10 years. In a series of gesture imitation tests, including finger and hand movements, the children were instructed to look at the model and mimic it. In one gesture, the examiner faced the subject and waved the left hand with an open palm facing outward, toward the subject. In this task some autistic children displayed what Ohta called partial imitation, which involved the failure to reproduce the target gesture from the vantage point of the model. These autistic children placed their palms inward, toward themselves, rather than outward, an error that never appeared in control subjects. Similar errors were made by about half the autistic children on each of two other imitation tasks, which corresponded to the competence of 3-year-old normal children. Ohta concluded that partial imitation, which seems to be some sort of failure of perspective-taking, is a disorder in imitation of gestures.

A distinctly simulationist interpretation of Ohta's findings was later proposed by Braten (1998). In face-to-face situations, remarks Braten, the reenactment of gestures by infants depends on perceptual reversal of the model's movements. To imitate properly in the outward-facing palms task, the child must leave his egocentric perspective and adopt that of the model, who sees the back of her hand rather than her palm. Braten says that the imitator must engage in "virtual co-enactment" of the model's movements *as if* he were the co-author of those movements. Although this terminology differs from standard simulationist terminology, Braten's idea is clearly simulationist, as he himself indicates.

Sally Rogers and Bruce Pennington (1991) surveyed the then-existing literature on imitation tests with autistic subjects and proposed for the first time that imitation is a key early foundation in the normal development of mind reading. Early capacities involving imitation, emotion sharing, and theory of mind, they said, are specifically deficient in autism. Rogers and Pennington specifically suggested that autism involves a biological impairment of the capacity to coordinate self and other representations, preventing the infant with autism from developing the notion that the other is a template of the self.

Soon after Rogers and Pennington's review, the picture was muddied by apparent nonreplications of imitation deficits in autistic subjects. However, Rogers (1999) revisited the issue and found methodological faults in the nonreplication studies. In several of them, almost all the subjects performed at or near ceiling levels, so that possible group differences might have been obscured. These ceiling effects prevented the extraction of any

information from the data. Rogers concluded that "every methodologically rigorous study so far published has found an autism-specific deficit in motor imitation" (S. Rogers 1999, p. 262).

Whiten and Brown (1998) pursued the question of imitation problems for autistic subjects. Their samples featured three categories of autistic subjects: autistic adults, autistic children, and what they call "young" autistics, i.e., children with a chronological age of 5. Their overall results did not show the general deficit in imitation implied by the Rogers and Pennington theory, because some imitative competence appears largely intact in all except the young autistic sample. However, imitative deficiencies in the young autistics were very striking. In "do-as-I-do" imitation tests, a group of normal 5–6-year-olds and even a group of children with mild learning difficulties had a median score at ceiling, i.e., 6.0, whereas young autistics had a median score under 1.5. This poor performance suggests that "in early phases of development there could well be the type of imitative barrier that Rogers and Pennington propose as fundamental in the cascade of deficits characterizing autism" (Whiten and Brown, 1998, p. 270). The Whiten-Brown results complement Braten's claims, inasmuch as autistic children had special difficulties with imitation tasks requiring the subject to invert the action from the observer's perspective to that of the actor. One task involved a grasp-thumb action, in which one hand of the model grasps the thumb of the other hand, which faces outward. Imitation errors involved reversals of the direction of either one or both hands.

Additional evidence of difficulties with self-oriented actions comes from a study by Hobson and Lee (1999). They set out to study difficulties autistic subjects might have in imitating the behavioral "style" of an action. Quite serendipitously, two of their tasks required subjects to act upon an object in a manner involving orientation to the self. In these tasks, there were sharp differences between autistic subjects and nonautistic controls. In one task, the experimenter took a wooden pipe rack in his left hand and held it against the upper part of his left shoulder, somewhat as one might position a violin. He took a wooden stick in his right hand and strummed across the ridges and slots of the rack three times, making a staccato sound. All but one autistic participant, out of sixteen, performed the action of running the stick over the pipe rack, so the majority of them had observed and could recall the action and understood that their task was to execute it. However, there was a striking difference in the ways the participants of each group held the pipe rack. Only two of the sixteen participants with autism held the pipe rack against his or her shoulder in the manner demonstrated, whereas a majority of participants without autism (ten out of sixteen) did so. In a second task involving self-oriented action, the experimenter brought a hand-sized cloth frog to his forehead and wiped it with the frog three times. Only five participants with autism, but a large majority of participants without autism (fourteen out of sixteen) spontaneously imitated brow wiping. Hobson and Lee interpret these findings in the manner suggested earlier, as supporting a deficit in perspective-switching in autism.

> The participants saw the experimenter perform the action in relation to his own body, but in order to imitate they needed to perform the same action in relation to quite a different body, namely their own. In other words, they needed to *identify* with the experimenter as acting in relation to himself, so that when their turn came, they would emulate not just the action but also the self-orientation with which the agent ... executed the action. It was this identification with the experimenter-as-self-orientated-agent that seemed to be deficient in the participants with autism. (Hobson & Lee, 1999, p. 657)

Leaving the topic of autism, I turn to Braten's (1998) simulationist interpretation of Meltzoff's (1995) finding that 18-month-old children "imitate" the failed actions of adult models with successful actions of their own. For example, when a model tried but failed to pull a dumbbell apart, a toddler successfully pulled it apart. Braten's plausible interpretation is that a child, in watching a model, "virtually" tracks the model's performance from an actor's perspective in his own "companion space." The child then proceeds to "imitate" what he has imagined as the action's goal, not what he has actually observed. It is noteworthy that Meltzoff and Moore (1998, p. 2), in a control demonstration, report that exposure to an *inanimate* model "attempting" to pull the dumbbell apart rarely results in the observer's reenactment. Consistently with ST, seeing a nonbiological entity does not trigger the kind of virtual tracking associated with mind reading.

Neurobiological support for the simulationist interpretation of imitation comes from the discovery of mirror neurons. First discovered in the ventral premotor cortex of macaque monkeys (area F5), mirror neurons constitute an observation-execution matching system (Rizzolatti et al., 1996a; Gallese et al., 1996). These neurons fire when a monkey performs a specific action, such as a precision grip, but also when a monkey is merely watching another individual (monkey or human) perform an equivalent action. Mirror neurons are especially associated with goal-related actions. We may therefore interpret mirror neuron activity as the neural substrate of an intention, or plan, to execute a goal-oriented action.

Observation-driven mirror neuron activity implies that when a monkey watches another individual perform a goal-related action, the observer experiences or undergoes a similar goal-related plan. Thus, observation-driven mirror neuron activity seems to consist in the organism's adopting the mental stance of the observed individual and replicating its goal representation. It is a case of coplanning or imaginatively coenacting the action executed by the observed individual. This does not yet constitute mind reading because the observing organism need not attribute or impute any mental state to the other, and may even lack the psychological concept of a desire or plan. Nonetheless, the phenomenon may be related to simulational mind reading insofar as the emulated state of planning the action in question is a natural launching pad for simulation-style mind reading (Gallese and Goldman, 1998).

Note that observation-driven mirror neuron activation does not generate actual imitative behavior, presumably because the neural activity is inhibited by mechanisms elsewhere in the motor pathway. Nonetheless, the monkey mirror system could represent an evolutionary precursor of the human mechanism for imitation. Such mirror systems have also been established in humans, and could subserve both the human capacity for imitation and the human capacity for mind reading. Other cortical areas that constitute matching or "resonance" mechanisms are doubly activated by observation of an action (e.g., finger movement) and by an instruction to imitate that action (Iacoboni et al., 1999).

Justin Williams et al. (2001) have recently advanced a developmental connection between mirror neurons, imitation, and autism that incorporates all the elements discussed in this section. They speculate that mirror neurons provide a key foundation for the building of imitative and mind-reading competencies. They join Rogers and Pennington (1991) in hypothesizing a developmental link between early imitation and such social abilities as shared attention, recognition of gestures, and language (especially the social and pragmatic aspects of language), as well as empathy and full-fledged mind reading. They propose that autism arises from some dysfunction in the mirror neuron system that lies at the base of the cascade of autistic problems. Endorsing Gallese and Goldman's (1998) simulationist interpretation of mirror neurons, they view this ontogenetic cascade from the perspective of ST rather than TT. The hypothesized mirror neuron dysfunction might affect all mirror areas or might be confined to just certain groups, such as those in the parietal cortex (identified by Fogassi et al., 1998). The dysfunction in question could interfere with early imitation and lead to the impairment of self–other representations, which, according to Rogers and Pennington, underpins autistic problems.

2.5 Imitation, Role Play, and Mind Reading

I turn now to a second sort of connection between imitation and mind reading as viewed from a simulationist perspective. The proposal here is that imitation contributes to advanced mind reading through the intermediate route of role play. Although role playing might be understood in a purely behavioral fashion (i.e., merely acting as if one were a so-and-so), it is here assumed that role play must also involve mental simulation. The role player must also mentally place herself in the shoes of an actual or imagined protagonist. Thus, the idea of role play, at least in the present context, ushers in simulationist ideas.

The first strand in the present proposal is to link role play to imitation by viewing it as a species of *extended imitation*. From the age of 2 years and onward, normal children engage in role play, i.e., acting out the role of a person or creature. Harris (2000) defines role play as a species of pretend play in which a child temporarily acts the part of someone other than herself, e.g., by impersonating a mother, a bus driver, or a soldier. His definition also covers cases in which a child enacts a role but projects it onto a doll or toy that serves as a prop for the role (Harris, 2000, p. 30). I propose that role play be viewed as a kind of extended imitation. Ordinary imitation involves the behavioral duplication of an observed action. An action is typically imitated at the same time that it is observed, but in deferred imitation, the actor imitates behavior that was previously observed and is now recalled. In the case of role play the actor need not imitate any actually observed behavior. There is, however, a *type* of behavior the actor is familiar with and which she imitates in some relevant respects. For example, consider a child playing the role of a bus driver. Although the child may not recall actions of any specific bus driver that she seeks to duplicate, she knows that bus drivers sit at the front of a bus, hold a steering wheel, call out stops as the bus proceeds, and so forth. Thus, when a child plays the role of a bus driver, she selects some such action types (as opposed to tokens) and seeks to copy them.

Another respect in which role play is "extended" is that it is *creative*. Children engaged in role play knowingly embellish a scenario along novel lines not previously witnessed. However, this does not preclude the behavior from being the imitation of a familiar pattern or prototype. If a

role-playing child pretends to engage in a telephone conversation, the detailed content of the conversation may be novel, but other features of the telephone transaction will replicate a familiar general pattern.

A third respect in which role play is extended imitation is that it involves more elaborate and intricate acts of intended *mental* imitation, i.e., trying to duplicate in one's own mind the (supposed) mental acts or processes of another. If what we said earlier about imitation and mirror neurons is correct, even primitive behavioral imitation may involve putting oneself in the model's shoes with respect to a motor plan. But in advanced role play, the imitator tries to copy more than just the motor plan of a model. She tries to mentally emulate more complex mental activity. The intended model, of course, need not be an actual person; it can be an imaginary one. But my hypothesis is that a child constructs a model, or uses a prop as an imagined model, and tracks that model's mental activity in her own mind, as evidenced by the verbal and nonverbal behavior that she displays.

These ideas are well illustrated by Harris's discussion of cases in which a child enacts a role but projects it onto a doll or toy that serves as a prop for the role (Harris, 2000, p. 30). Children often immerse themselves in an imaginary role and speak as if they were themselves experiencing it from the point of view of the invented person or creature. They use terms of reference, including deictic terms, appropriate to the adopted role (Harris, 2000, p. 30). They give expression to the emotions, sensations, and needs appropriate to the role. For example, John at 21 months is playing with his Jack-in-the-box, and he often impersonates Jack. If Jack's hand is poking out when John closes the lid, John says "Ouch, ouch. Boo-hoo" (his word for "hurt") (Wolf, 1982, p. 319; paraphrased from Harris, 2000, p. 31). During the period from 2 to 3 years of age, children often conjure up an imaginary person or creature whose identity remains stable over many months—a sort of companion to the child. As Harris indicates, this process is a clear example of simulation. I am hypothesizing that such simulation is an extension of the more primitive phenomenon of imitation, but differs from imitation both in its comparative creativity and in its greater preoccupation with creating the mental life of an imagined character.

Continuing to draw from Harris's summary (2000, pp. 42–45), the next point is that experimental evidence indicates that role play makes a positive contribution toward mind-reading performance. Astington and Jenkins (1995) and Schwebel et al. (1999) found that children who engaged in more joint play, including role play, performed better on mind-reading tasks, but no such connection was found for solitary pretence, which involves just objects and props rather than role play. Taylor and Carlson

(1997) checked whether 3- and 4-year-old subjects had invented an imaginary character. Those 4-year-olds who had previously invented an imaginary character performed better on belief tasks, even when age and verbal ability were controlled for. No effect was found for 3-year-olds, but few of them engaged in this type of role play.

One might object that perhaps skill at role play is an effect of mentalizing ability, not a precursor and cause of it. Youngblade and Dunn (1995) addressed this objection with the following study: A group of toddlers were assessed for pretend play first at approximately 33 months (i.e., before age 3) and then again 7 months later, at about 40 months. A key result was that pretend play at 33 months was linked to better performance in belief tasks at 40 months. Since 33 months is an age at which children usually fail false-belief tasks, it is unlikely that the variation among the children in pretend play at 33 months was a consequence of their preexisting false-belief competence at that age. Note that among the measures of pretend play taken at 33 months, only role enactment was a predictor of understanding false beliefs. Thus involvement in role play, which gives practice at mental simulation, is an advance predictor of later success in belief tasks (Harris, 2000, p. 45).

Putting these pieces together, we have a progression in which behavioral imitation is first enriched and expanded into role play, which includes mental imitation or simulation. Second, practice at such mental simulation makes a contribution toward mastery of mind reading as represented by improved success in belief tasks. Thus, when mind reading is approached in a simulationist mode, a clear pattern emerges in which imitative enrichment featuring role play gradually leads to increased competence at advanced mind reading. Conversely, it is well known that autistic children, who characteristically have serious impairments in advanced mind reading, also show (earlier) deficiencies in role play.

Note, finally, that there is no incompatibility between the two connections I have sketched between simulationist mind reading and imitation. Either link alone could be right, or both could be right. So ST has abundant resources for claiming to find important connections between imitation and mind reading.[2]

2. See comments on this chapter by W. Prinz (vol. 2, ch. 8.3, p. 180) and by Millikan (vol. 2, ch. 8.4, p. 182). ED.