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Editors

Handbook of Neurosociology

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Chapter 4

Social Cognition and the Problem of Other Minds

John R. Shook

Where in the World Are Minds?

A classic problem of philosophy is the “problem of other minds,” a special case of the general problem of knowing the “external” world. The problem of other minds is this: by what justification, if any, can we know that other minds exist? Bertrand Russell well-formulated the empiricist version of this problem, saying that “there seems no reason to believe that we are ever acquainted with other people’s minds, seeing that these are not directly perceived” (Russell 1905, 480). This empiricist formulation, bequeathing an eighteenth-century philosophical problem upon the twentieth century, is basically Cartesian – minds have such discrete and separate existences that experience cannot unite them or even bring them into contact with each other. Even more mysterious than the external world, of which experience must only be a thin inner representation, those other external minds cannot be reached by experience at all.

This Cartesian legacy established the terms for the modern “problem of other minds.” Philosophers and psychologists within that tradition deal with the question of how other minds are to be known by first taking all minds to be strictly separate and individuated things. From the perspective of a mind, therefore, any other minds are entirely theoretical matters, as any knowledge of them can only be inferred from what is perceived. Other minds are even more remote and undetectable than atoms, since atoms are not merely theorized but they can be instrumentally detected; no inspection of anything in nature will expose a mind to view. Still, we can theorize about what other minds could be like. Cartesianism takes one’s own mind to be the best known thing, so it follows that a person’s knowledge about other minds is dependent on one’s conception of one’s self as a mind. Essentially, we have to theoretically project another mind of the same sort that we take ourselves to already have. On this line of reasoning, we can only project what we already can conceive, after all, and our best conception about whatever minds do exist has to be completely reliant on the only mind we know best, namely, our own.

The Cartesian theory of mind therefore leads to a radically individualistic presumption that self-knowledge of one’s mind is both logically and developmentally prior to knowledge of other

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minds. Where's the problem, then? The "problem of other minds" erupts within Cartesianism when the fallibility of theoretical inferences from mere perceptions is taken seriously. It is not necessary to go to great skeptical lengths to simply show that knowledge of other minds must be a quite fallible matter, since other minds are so thoroughly hidden from natural view. How could any knowledge that other minds even exist receive adequate empirical justification? Perhaps we know little or nothing about other minds. Early Cartesianism linked itself to metaphysical dualism, holding that the self-certainty of one's own mind guaranteed a mental reality in addition to any natural reality. However, Cartesianism's individualistic agenda could be carried on by a materialist worldview. The school of "Cartesian materialism," as philosopher Daniel Dennett (1991) labeled it, continued to maintain that some parts of the brain are responsible for what we know best: our inner veridical experience of our own mind.

Philosophers and psychologists operating within this Cartesian legacy have had too easy a time developing their positions without dealing with the actual development and practical workings of human minds. How could self-knowledge of one's mind really be developmentally prior to knowledge of other minds? Not even folk psychology accords well with this legacy. Think about how folk psychology works. For example, folk psychology takes minds as forming intentions to do things – now, does a child first learn that she forms intentions, and only then begins to project intentions into other people's minds? Minds also have beliefs – but does a child first learn that he has beliefs, and only thereafter ascribes beliefs to others' minds? Minds use language to express propositional beliefs – does a child first acquire some language, and only thereafter judges that other people are using language to express their beliefs? Minds use concepts to categorize things in the world – does a child first acquire some concepts, and only thereafter attribute those conceptions to other minds? Minds take on social roles (being a parent, a child, a neighbor, etc.) – does a child first know what it is like to take on some social role, and only thereafter understand that someone else is minding their social role?

When Cartesian mental theorists attempt to explain how people behave socially, coordinating their conduct for mutually agreed aims, they inflate these developmental puzzles into paradoxes. Having assumed that minds must have quite discrete and separate ontological existences, and that they can only know each other by inferences from what each can observe of others' conduct, this "methodological individualism" of modern Cartesianism sets up huge obstacles for explaining how minds can be coordinated. For most of the twentieth century, psychologists and philosophers have struggled with this narrowly empiricist and Cartesian framework as they tried to explain knowledge of others' minds, and indeed the possibility of knowledge in general.

The Psychology of Individual Minds

Twentieth-century psychology inherited this Cartesianism in various forms even as it proposed to break away from armchair introspection. By regarding the subjective and personal as logically and ontologically more basic and real than anything else in the human world, the individual is given explanatory priority. For example, Skinner's methodological individualism regarded all social entities and events to be entirely explainable in terms of aggregate actions of intelligent agents (Skinner 1938). Skinner never regarded the cognition of others' minds as a serious possibility, instead taking any cognition of others as amounting to just the anticipations of habitual behaviors (Skinner 1953, 1983). This Cartesian individualism encouraged innumerable investigators to experimentally isolate subjects to try to discern their genuine capacities as lone thinkers and agents. For generations, behaviorists (and many in other psychology and psychiatry paradigms as well, including Freudians) preferred to study children individually apart from any dynamic social context. Piaget regarded the infant as a solipsist, who is "unaware of himself as subject and is familiar only with his own actions."

(Piaget 1954, 352). Why should the inherent contradiction within Piaget's claim here, between the infant's ignorance of himself and the infant's knowledge of "his own" actions, be so hard to detect? The well-intentioned view that mind is acquired socially goes immediately awry if an excessively Cartesian notion of infant experience is presumed.

Indeed, it is the case that infants lack the cognitive capacities to understand themselves as subjects, but all the same, infants rapidly become familiar with the actions of others, within weeks of birth. Only within the past two or three decades have many researchers really questioned what it could mean for an immature mind to gradually learn that it has a subjective existence and individualized capacities. Evidently, an infant's social interactions with mature minds are responsible for the growth of the infant mind in the first place; both the infant mind and its understanding of other minds grow together. Social cognition must be essential to mental growth – a fact mostly unappreciated by both philosophy and psychology during most of the twentieth century. Not even Piaget, nor Vygotsky (1978), supplied plausible sketches of the development of social cognition. The founder of American psychology, William James, was among the first to describe the several social selves we all use throughout life. His pragmatism unified cognition with action – "My thinking is first and last and always for the sake of my doing" (James 1890, 333) – yet James did not elaborate a developmental social psychology. The most philosophical of social psychologists writing in the English language, John Dewey (1922, 1938) and George Herbert Mead (1934), did offer some empirical-based theories of childhood learning and social cognition. However, they were largely ignored by academic psychology during most of the twentieth century, and the debate between two kinds of individualism – reductive behaviorism and non-reductive Cartesianism – preoccupied Anglo-American academic philosophy instead.

Behaviorists generally continued to assume that behaviors acquired and displayed by the organism in isolation are the core structures permitting interactive behaviors. This individualism, taking the situation of "self confronting world" as primary, was also central for main opponents of behaviorism. If the self's experiences after birth are insufficient for accounting for matured social skills, then there must be native cognitive structures doing the real work all along. Noam Chomsky proposed that infants are born with something akin to an adult theory of mind consisting of basic structures of social cognition, especially a universal grammar for semantic interpretation permitting fast language facility (Chomsky 1968). Jerry Fodor agrees, finding that the possession of an innate computational theory of mind is needed to explain the development of social skills during young childhood (Fodor 1987, 132). As befits its dualism, Cartesian individualism can also aid resistance to empirical science. Dale Jacquette represents an anti-naturalistic continental tradition by pronouncing that intentionality, as the essence of personal mentality, cannot even be conceptually analyzed or explained in terms of anything else (Jacquette 2011).

Respect for shared mentality and social cognition has only been partially restored in the philosophical field of social ontology. John Searle's attempts at social ontology and the origin of social facts and institutions still harbor lingering Cartesianism. Searle's Cartesian individualism has never been disguised: "Collective mental phenomena of the sort we get in organized societies are themselves dependent on and derived from the mental phenomena of individuals" (Searle 2010, 4). For society, the most important kind of mental phenomena are internal symbolic representations. Since an individual cannot directly display his symbolic representations, he uses language to express them, and that behavioral conduct is observed by others, so that they can theoretically infer what symbolic representations are intended. On Searle's account, our capacity to see the match between someone else's representations and our own permits what he called "collective intentionality": two or people intending the same thing. However, Searle's individualism remains strict: "all human intentionality exists only in individual human brains" (2010, 44). Since group plans depend on shared commitments, and one's commitments are in the form of symbolic representations requiring linguistic expression, then one can only tell whether another person has the same commitment through that person's statements. However, not just any sort of statements will do. I can form a

theory of your mental commitments, according to Searle, only after you utter “declarations” that state your intentions. Searle rightly denies that “We-intentions” are reducible without meaningful remainder down to sets of “I-intentions.” However, his Cartesian Theory of Mind assumptions obstruct any explanation of how “We-intentions” could form.

Cartesian individualism obstructs practical collective intentionality. I could learn that “You intend X” and match that up with “I intend X” but so far all that adds up to is “Both you and I intend X,” not “We intend to do X together.” Matters are not improved even if I learn that “You intend that we do X” and I add that “I intend that we do X.” Logically, they add up to “We both intend that we do X together” but from a developmental perspective, what could really happen here? How do children begin to participate in collective intentionality? Searle’s Cartesianism assumes far too much. What if one of us is quite immature, and has little notion of how we could do X? If I have little idea how we could do X, can I really intend that we do X even if I want to do X and I understand that you intend that we do X? A small child can intend to “help Daddy bake a cake” in some vague way, but the child will not actually be able to participate in the baking a cake even after understanding that Daddy intends for the child to help.

Developmentally, there is a vast practical gap between “We intend X” and “We are doing X.” Searle assumes that “We intend X” must always be logically and epistemically prior to “We are doing X” but that can’t always be the case in the real world, and it certainly cannot be developmentally correct. Logically, people can form “collective intentions” but they are not automatically practical intentions leading to group conduct. A small child will not know what her parent practically intends to do when making a cake, not does the child have much of a conception of what he can do to help. During young childhood, none of us began engaging in any sort of group activity by first accurately conceiving what we are supposed to do, verifying that all of us intend to do this together by hearing each other’s utterances, and then undertaking our specific conduct to complete the group activity.

Social Psychology and Social Cognition

Serious studies of developmental social behavior did begin to propose alternative explanations in the 1970s and 1980s. Social cognition has come a long way from its long period of neglect during most of the twentieth century. However, the theoretical stance that developmental psychology must be thoroughly social and that most of adult cognition remains social is still thwarted by narrowly Cartesian definitions of social cognition. Social psychology and social neuroscience, along with psychology in general, often design inquiries using an excessively Cartesian framework. Perhaps this is due to social cognition’s heavy reliance on the cognitive psychology of the 1970s when social cognition was struggling for recognition. Comparative social cognition, especially pioneering primate studies that revealed how adult primates and human children can have similar developmental stages for comprehending others’ mental states, also perpetuated Cartesian assumptions.

In social psychology, the “theory of mind” theory appears to innocently propose that immature brains acquire understanding of others’ beliefs, intentions, and plans through observation of others. According to folk psychology, minds possess inner mental states, among them such things as beliefs, intentions, and plans, which cannot be directly observed. Not surprisingly, the “folk” involved are almost always modern Western peoples whose tacit or explicit Cartesian views on personality and mind are well-entrenched. The developmental psychology of brains acquiring folk psychology can remain thoroughly infected with that same individualistic Cartesianism, since it will be assumed that the proper aim of immature brains is to develop into Cartesian minds and understand others as Cartesian minds as well. Definitions of things like the “problem of other minds,” “theory of mind,” and “metacognition,” and even definitions of social cognition, can remain thoroughly infected with this Cartesianism.

Consider how definitions of social cognition make individuals central to the point of exclusivity. A typical definition runs like this: “human social cognition encompasses all cognitive processes relevant to the perception and understanding of conspecifics” (Jacob and Jeannerod 2005, 21). Is this kind of individualism, in which a lone individual is responsible for understanding just one other lone individual, still warranted? Should social cognition embrace only comprehension of other nearby individuals, and not anything else in the local human environment too, such as kitchens, libraries, race tracks, town halls, or parks? Is it possible to understand others apart from that environing context, and is it possible to understand that environing context without comprehending others? A narrow Cartesian approach won’t disagree that knowledge of the environment is required too, but it does imply that such knowledge does not come from social cognition, but other modes of cognition instead. A narrowly individualistic definition of social cognition abstracts people away from the lived and built human environment. Compare that narrow definition above with a broader definition:

Social cognition, more generally, constitutes the process by which people think about and make sense of other people, themselves, and social situations. (Fiske 2010, 128)

This broader definition of social cognition locates it within its proper home of social situations containing people modifying their environments.

Broad definitions of social cognition, and expansive depictions of social cognition’s core role in explaining human psychology, behavior, and culture, have become more common (for just a sampling, consult Gazzaniga 1985; Bandura 1986; Wertsch 1991; Bogdan 1994, 2000; Schulkin 2000; Frith and Wolpert 2003; Schmitt 2003; Easton and Emery 2005; Cacioppo et al. 2006; Vogeley and Roepstorff 2009; Rochat 2009; Franks 2010). Investigations of “the social brain” have been underway in a variety of interrelated fields, from developmental and abnormal psychology to cognitive science and social neuroscience. There are robust empirical resources for locating such things as intentionality, agency, and intelligence firmly within the context of social cognition. It is becoming more widely recognized that both Cartesianism in general and individualistic reductionism – Leslie Brothers calls it “neuroism” (2001) – are theoretically inadequate as both philosophies and scientific research programs. Bold surveys of recent research have reached the stage of judging that social cognition cannot be an emergent phenomena from aggregate individual cognitions, but rather that any individualizable cognitions, including much of self-consciousness and agency, are emergent from a more fundamental field of embodied and dynamic social interaction (see, e.g., Rakison 2005; Robbins 2008; Smith 2008; Adolfs 2009; De Jaegher and Froese 2009; De Jaegher et al. 2010; Kitayama and Park 2010; Theiner et al. 2010; Krueger 2011; Schulkin 2011). Smith and Conrey (2009) neatly summarize their approval of this research trend:

- (a) Cognition is for the adaptive regulation of action, and mental representations are action-oriented. (b) Cognition is embodied, both constrained and facilitated by our sensorimotor abilities as well as our brains. (c) Cognition and action are situated in the sense of being contingent on specific aspects of the agent’s social environment. (d) Cognition is distributed across brains and the environment and across social agents (e.g., when information is discussed and evaluated in groups).

Once taken to be the exclusive possessions of individualized minds taken singly, our complex cognitive processes are proving to be capacities only of brains taken collectively.

Consider how social cognition has always started from our perception of the environment around us. Perception at first glance can seem the most localizable and personal of matters. However, people don’t just observe people who are in turn observing them. People observe people doing things, and usually we are observing people doing things together. We don’t simply track and comprehend peoples’ behavior – we closely observe and understand what they are trying to do with their surroundings. Strictly speaking, we aren’t really interested in understanding people, but rather in understanding what people think they are accomplishing. Considering how such diverse things as operating a research laboratory, working in an office, shopping in a mall, vacationing in Paris, singing in a choir, constructing a building, filing tax returns, and passing legislation are all social situations, social cognition is practically everywhere in the human world. None of those social situations

will proceed well, if at all, without elaborate understandings of others and what they are doing to their environments.

Comprehension of anything that involves human know-how or any social institution will involve social cognition. Trying to navigate a grocery store from entrance to exit with purchases is thoroughly a series of social cognition tasks, even while deciding on which cereal one's children like or figuring out how to justify buying an expensive cut of meat. Remembering what others have done, recognizing what other people are doing, communicating with others, and anticipating what others may do in the future are cognitive tasks at the heart of most anything cognitive that we do every minute of every day. This portrayal of pervasive social cognition is consistent with a broader understanding of all cognition as originally acquired and ultimately serving our conduct through life's many activities.

What Do Minds Learn to Mind?

It is a hard social fact that humans have to learn how to engage in group activities before they have any adequate conception of what each of them is supposed to do. We are not born with internal representations of how social activities are to be done. This fact of human development is not that different from a related social fact that also must be correct: We do not first understand our own internal minds and then experimentally project them on others. This can't be true of infants, and it can't become true thereafter through childhood. In fact, our capacity to understand the minds of others is developmentally linked with the development of our capacity to engage in group activities. Indeed, all we have to go on, from birth, is our engagement with the behaviors of others. However, those behaviors, and not any internal representations or intentions, are the genuine beginning place for mental capacities. Not only must humans learn how to engage in group activities before they have any adequate conception of what each of them is supposed to do, humans must engage in group activities before forming any ideas about any minds whatsoever, their own or others.

Furthermore, it is only through successfully engaging in many sorts of group activities before the age of four that young humans acquire minds. Only a more mature mind can help form another mind, and the more mature mind can only do this by engaging a younger mind in coordinated habitual activities – this much social behaviorism must be right. But Cartesian individualism is not needed. The younger mind need not form adequate conceptions of what the mature mind intends first, before successfully participating. Quite the opposite: it is only by attending to what the mature mind is doing and achieving that the less mature mind could acquire some partial conception of the mature mind's intentions and beliefs. In effect, "We are doing X together" must developmentally come prior to "You are intending that we do X," which in turn is developmentally prior to "I intend that we do X" – and only after that does the child go on to form additional notions such as "I believe X should be done" or "I believe that X is done this way." The child's internal mind only possesses intentions and beliefs after having successfully engaged in many group activities and formed notions of others' minds. Understanding group activities, one's social roles, and others' minds has developmental leadership guiding the acquisition of one's own mind.

Social cognition is not an intellectual capacity that develops at some particular age or specific stage. Many different kinds of cognitive tasks are involved with intelligently dealing with other people and social situations. These various cognitive tasks have their own time frames for normal emergence, as the kinds of age-specific social activities needed for acquiring the correlated cognitive abilities are successfully managed by the child during growth. As the complexity of the social activities grow, so grows the brain's structures. This is a very long process involving many areas of the brain: "the neural structures implicated in social cognition develop over an extended period from infancy until young adulthood" (Payne and Bachevalier 2009, 52). The primary setting for this protracted period of social development is the family. Children acquire facility with familial social

conduct, activities, and roles, which in turn prepare them in turn for learning about adult social interactions and roles (Adolfs 2003; Flinn and Ward 2005).

The developmental stages needed for the emergence of social cognition begin in early infancy. The processing of visual perception is inaugurated in the first few months after birth. Acquiring familiarity with 3-Dimensional objects and their basic geometrical properties, learning notions of object permanence, and coming to expect that objects will follow certain motion trajectories (under conditions of inertial movement and the effect of gravity, e.g.) occur during the first year. Infants are also gaining facility with face recognition in general and remembering individual faces and individual identities during this period. They start to imitate the facial expressions of others and keep track of their imitative responsiveness, they acquire preferences for familiar faces and prosocial interactions with others, and they can track the identities of individuals by their characteristic behaviors (see surveys of infancy cognition in Ellis and Bjorklund 2005; Csibra and Gergely 2009; Hamlin and Wynn 2011; Meltzoff 2011, and see also a discussion of the role of “mirror neurons” in Sinigaglia and Rizzolatti 2011). By the end of the first year, infants cognize others as following familiar behavior patterns and expect older family members to be participating in social interactions in only certain habitual ways. By 8 months, infants recognize normal routines based on what they have been observing in prior months, and by 12 months they anticipate the appropriate goals and means of accomplishing them if they themselves have been successfully doing those actions too. Infants understand how daily social interactions are supposed to proceed in proportion to their opportunity to be regularly observing and participating in those interactions (such as recognizing the “right way” for people to be feeding after they have been successfully feeding themselves; see Gredebäck and Melinder 2010).

Infants acquire robust capacities for cognizing everyday social interactions in which they are directly and successfully involved, and their direct engagement in the full-blooded 3-D world of dynamic objects and supportive agents is the developing brain’s cognitive priority. This all makes solid evolutionary sense; the brain’s infantile cognitive processes are fixated on managing tasks most relevant to its survival through infancy. The infant’s field of perception is the environing 3-D world, and not any sort of inner Cartesian theater. The infant brain is not cognizing phantasmal projections that have reached some ghostly internal field of consciousness. For the infant, perceptual consciousness and the enveloping field of social action are identical. After 12–15 months, anything that significantly departs from the perceptual and causal norms of the dynamic realm of 3-D objects and agents requires additional cognitive work and developmental time. That is why, for example, infant cognition in perception of 2-D representations through artifacts such as picture books and television screens requires another further stage of cognitive development, which is not identical with 3-D cognition. The “video deficit effect” is one notable instance of this cognitive divergence, as infants in their second year learn less from 2-D observation than 3-D observation. Until extra cognitive capacity for interpreting and translating 2-D representations and demonstrations into familiar 3-D modes is acquired, the total cognitive load is too high for smooth transfer of learning, but during the third year the deficit is largely erased (Strouse and Troseth 2008; Barr 2010). A similar effect is discovered among adults of a culture which has never used 2-D representations, as they are unable to fully understand information conveyed in photographs or films, for example.

Along with these many cognitive developments, infants are simultaneously attending to the gesturings and the vocal sounds and intonations of others, building up the cognitive abilities needed later on for successful verbal communication about goings-on in the environment. Infants follow others’ gazes to nearby objects, they quickly learn how to look at things others are looking at, and later on, they can attend to objects handled and then gestured at by others. Simpler modes of communication such as gesturing and using vocal clues function as signaling by the infant to obtain what it wants from others. During the second year, infants are signaling and communicating in robust and flexible ways with a proto-vocabulary and they understand many simple communicative intentions of others (Aureli et al. 2009; Grosse et al. 2010).

Early language acquisition occurs almost entirely within the dynamics of mutual engagement in daily activities; language is not acquired simply by the infant's hearing of spoken words in isolation from any other ongoing interaction or activity. The meaning of language from the start is entirely embedded within significant activities. Words are first connected with ongoing events, not any things in isolation, and intentional reference exists not for the sake of picking out static objects, but for making desired things happen. Words mean intended results, not anything particular involved in that process – for a 2-year-old, for example, “cup” mostly means the speedy delivery of the seen cup's contents to the child's own mouth. That is how words acquire their primeval intentionality, by being parasitic on the goal-oriented intentions of actions and gaining powers to deliver successful results. Words are not essentially about static correspondences between just two things, vocal sounds and individuated objects, but rather about triadic dynamic engagements in which at minimum two people use words together to habitually initiate and guide a desired plan of action (Zlatev et al. 2008).

Through focused attention on others' conduct near them, infants become intense imitators of others' actions and manipulations of things. Infants will play with most anything in their reach, but they show preference for imitating actions on familiar objects that they observe others' doing first. The opportunity to repeatedly observe the same actions on objects by others and to practice those actions themselves results in the greatest transfer of manipulative ability (Yang et al. 2010). Furthermore, observing the practical success of object manipulation to some intended result increases the attention given to imitating and practicing that mode of manipulation by the infant throughout the second year and thereafter. Infants pay attention to reliable models of practical success and center their imitation there (Zmyj et al. 2010).

Although infants detect goal-oriented conduct by others and practice successful activities in dynamic learning, only imitation, and not creative emulation or novel construction, characterizes their behavior during early childhood. Through age 5 or so, children attend to older peoples' conduct largely in order to duplicate both their means and their ends, rather than to invent novel means to the same ends. The earlier emphasis on careful imitation and later development of experimental emulation indicates that children are remembering both the appropriate means to be used in the short term, and also the preferred goals in the long term (Simpson and Riggs 2011). Attending to one's own imitation of others, and attending to whether others are imitating one's self, is a constant cognitive preoccupation during early childhood. Mutual imitation is an essential aspect of the development of social cognition; we naturally appreciate and gravitate toward responsive behaviors intentionally coordinated with our own, and we acquire better coordination and communication skills through such processes (Meltzoff 2011; Tasker and Schmidt 2008).

The infant's capacities for sustained joint attention to, and successful participation in, interesting and engaging activities with others are capacities that develop further into what has been called “executive control.” The heightened ability to focus on and figure out coordinated activities that culminate in successful practices, whether in free play or assigned tasks, demonstrates how many cognitive processes are functioning well together. Cognitive functions like “working memory,” “impulse inhibition,” “cognitive shifting,” and “information integration,” as specifiable yet complex aspects of developing social cognition, indicate how such things as attention, recognition, recall, prediction, coordination, language, and joint planning are all tightly integrated together as they develop through childhood (Wiebe et al. 2011). It is unnecessary to postulate a newly developed center of superior cognition, where this “executive” command sits as task master, since the emergent coordinated functioning of many lower-level processes is sufficient to explain the improved performance during childhood.

Avoiding neural Cartesianism is also wise in light of research on adult brains, which cannot find cortical evidence of a supreme command center constantly initiating or directing action. Social action, and not personal action, appears to have priority. Although the medial prefrontal cortex is proving to be a significant region serving functions for personal executive control, that region is

thoroughly interlinked with cognition about social situations done by processes widely distributed across the brain (Graybiel 2008; Bogdan 2009; Krueger et al. 2009; Nummenmaa and Calder 2009). Executive control over tasks and management of social situations are two ways of looking at much the same thing. Daniel Dennett, in his resistance to the Cartesian legacy, has similarly supported the idea of a social self that is a flexible controller of one's own behavior (see a discussion in Franks 2010, 138).

In the pragmatist tradition, this developmental congruence of executive control and management of social situations is no mystery. George Herbert Mead offered two sociological paths to understanding the social nature of voluntary action and agency. One is through his concept of role-taking, and the other is his theory of the act. Role-taking offers a unique theory of self-control which is also social control. Here persons respond to their own emerging actions as they imagine the other will, and use this co-responding to guide the future course of their actions. This presupposes a universe of discourse wherein persons share the meanings of their symbols, making the process both individualistic and social. Mead's theory of the act involves four stages. First, action as some impulse to behave. Second is perception, which is selective, as we perceive most clearly that which answers to, or facilitates our interest and intentions to act. Third is manipulation, which involves doing something with objects, or with people such as role-taking. Fourth is consummation, where the last stage of the act is present in the first stage, as we experience some fulfillment of our intention. This is a teleological account of social behavior, since our conceptions of our intentions literally pull us along the stages of action through to completion, rather than just supply some initial push as if action was a deterministic conditioning process. Another aspect of Mead's voluntarism is therefore that we can modify our intentions at any stage, in light of how that action is going or in light of new information about the situation, in order to change our course of action. Mead's theory of agency is nothing like the Cartesian model of an isolated mind steered by an internal command center issuing orders to the rest of the brain.

Brains and Minds Grow Together

No Cartesian mind is developing within infancy and childhood. Children do acquire facility with the intentions, practices, and attitudes of others through social interaction. If the possession of a "mind" consists of advanced cognitive capacities for focused, flexible, and successful social practices, infants already detect and rely on the minds of older people – infants do notice and take advantage of the more mature cognitions occurring around them. Infants develop understandings of the mindings of others, for they closely attend to the mindful conduct around them, and learn to match them with their own.

It is crucial at this stage of the discussion to prevent Cartesianism from erupting again. Even to ask the typical question, "When does the child leap from observations of mindful behavior to inferences about the inner mental states of others?" is a mistaken and misguided curiosity. The appreciation and utilization of another's mindful conduct is precisely the appreciation of another's mind; there simply is nothing more to discover. Not even the acquisition of full language and the understanding of another's utterance "I believe P" is anything but the appreciation of another's mindful conduct. Either there is replete mindfulness in one's conduct, or there is no mind anywhere. Cartesians, of course, point to adult mental states and events that can consciously occur without any overt action, but these are highly refined capacities not characteristic of the business of ordinary life, and surely not of childhood.

To presuppose Cartesianism, that one's appreciation for another's inner mental life is a matter separable from the appreciation for another's mindful conduct, is to assume that Theory of Mind

is not merely distinguishable, but quite separable, from Social Conduct. This notion that the acquisition of theory of mind is just as grounded in observations of behavior yet results from distinct cognitive mechanisms is a demonstrably inadequate notion. Every developmental stage exposes that theoretical inadequacy. The classic example of infants grasping how others can have false beliefs proves to always be a capacity that develops within the wider context of an infant's strengthening ability to anticipate the practical goals of others by observing their conduct (Buttelmann et al. 2009; Caron 2009). Estimating the false beliefs of others especially depends on the child perceiving what others can see and do, and hence what they can know about, while reasoning to judgments about others' true beliefs develops at a later age (Fabricius et al. 2010). Judging the intentions of others is tied to situational context; for example, 3-year-olds not only follow the intentions of others to engage in play, but they figure out normative rules for conducting pretend play, and they enforce rules of play only on those who have willingly entered the field of pretense as actors (Sobel 2007; Williamson et al. 2010; Wyman et al. 2009; see also Mead 1934 on play as preceding role-taking).

A young child's development of executive control is another kind of practical functioning that grows right together with that child's practical ability to appreciate others' mental processes, such as attitudes, emotions, or beliefs. Indeed, developing executive functioning in social conduct has priority, as training in executive function enhances both executive function and theory of mind, yet just training in theory of mind alone won't enhance either executive function or theory of mind (Moses and Tahiroglu 2010). Better than any training is the child's participation in social activities such as playing games, especially games involving a co-player sharing common goals, in which executive function is efficiently enhanced (Qu 2011). Children with more siblings, and hence greater participation in group role-playing dynamics, develop theory of mind faster (McAlister and Peterson 2007). The mutual development of executive function and theory of mind remains consistent from infancy through young childhood (Blaye and Chevalier 2011; Henning et al. 2011). An older child's capacity for reliably identifying others' diverse mental states such as intentions and beliefs is thoroughly dependent on developed skills at conversational language in conjunction with social activities, and typically emerges by age 7 or later (Garfield et al. 2001; Mull and Margaret Evans 2010; Wang et al. 2011).

The heavy reliance on social cognition for the development of one's cognitive capacities is not a temporary matter that diminishes in adulthood. The young social mind only develops further into a mature social mind. Adult learning and practice remains almost entirely social matter, from conversation and reading to participation in scientific inquiry. Common processes underlie theory of mind capacity and participation with coordinated joint action in adulthood (Humphreys and Bedford 2011; Pezzulo and Dindo 2011), and the brain's tendency to prioritize and preserve the impact of social interaction and coordination remains a pervasive adult phenomenon (Oullier et al. 2008; Iani et al. 2011). The dynamics of group intentionality remains a controversial topic, as to be expected when ordinary language, folk psychology, and Cartesian individualism all conspire to lend presumptive credibility to a nominalistic status for intentions, and an instinctive revulsion toward "group mind" lingers across analytic philosophy. Robust efforts at accounting for group or collective intentionality (such as Gilbert 1989; Bratman 1999; Miller 2001; Meggle 2002; Tuomela 2002; Pettit 2003) are increasingly able to take advantage of the experimental and neuroscientific evidence for the mutual development of shared intentionality (see the recent work in Schmid et al. 2008, 2011). Because participation in shared practices with common goals is so tightly interfused with individual goal pursuit (Shteynberg and Galinsky 2011), individual intentions and personal agency cannot be neatly distinguished when empirically studying socially synchronous conduct. Taking the social situatedness of adult cognition seriously, it should further be expected that enculturalization into adult roles powerfully shapes both one's modes of agency and one's self-conception of one's own agency (Hannover and Kühnen 2009).

Socialized Brains Remain Social Minds

In summary, Cartesian-minded psychologists and philosophers have little empirical support for any presumption that knowledge of any mind, one's own mind or minds of others, is developmentally prior to or independent of mindful participation in social activities. We do not first develop internally aware minds and then inferentially project mental states on others. More generally, we do not infer internal mental states that have any radically different ontological status from the traits of external observable behaviors. What we observe from infancy to adulthood is simply mindful behaviors of both ourselves and others; intentionality and mentality is fully in these behaviors, or they are nowhere. The logical point that a person's observably mindful behaviors underdetermines any estimate of that person's ongoing mental states cannot help prove that we go far beyond information-poor behaviors for hypothesizing information-rich mental entities. Such behavioral underdetermination only shows how our judgments about attitudes, intentions, and beliefs are somewhat vague and fallible, not how we must postulate such things so that they transcend all behavior (and any neural events as well).

How we developmentally come to conceive ourselves as individualized mental selves is not to be identified with the strict individualism and proto-dualism of Cartesianism. Put another way, radical Cartesianism has quite a different origin than humanity's long journey of socialization into modes of mentality. The idealistic view that there really are inner mental states only contingently exemplified in behavior must be a view inculcated quite apart from the natural reality that we acquire contingent notions about intentions, beliefs, and the like only through engaging in intentional and thoughtful conduct with others. How the radical dualism and individualism of Cartesianism originated as a cultural construct is a tale best left to intellectual historians; it no longer need concern experimental psychologists or social neuroscientists.

An adequate naturalistic theory of the development of social cognition, partially sketched above, constitutes the solution, or rather the dissolution, of the philosophical "problem" of other minds. This solution shows how understanding group activities and one's social roles has developmental leadership guiding the twin abilities to understand others' minds alongside developing one's own mind. Searle has it backwards – the reality is that the mentality of individuals is dependent on and derived from the collective mentality of organized societies. Searle used the term "mental phenomena" in his own phrasing, and deliberately so, for heightened Cartesian effect. However, naturalism should avoid metaphysical arguments that conflate phenomenality with cognition – such as dismissive diversions about how only individuals have experiences while societies don't – so that empirical studies of actual human cognition can proceed unimpeded by lingering Cartesianism, even Cartesian materialism. Searle supposes that his kind of brain-localized individualism is the only way to stay true to naturalism when he says that "all human intentionality exists only in individual human brains," as quoted above, yet empirical research cannot lend its support here, either.

Cognition is what brains do, and when brains do cognition jointly, then human intentionality and agency exists in multiple brains necessarily functioning together, not in any aggregate of separate brains contingently functioning side by side. From a neurological perspective, why should the Hebbian process of "neurons firing together are wiring together" get arbitrarily halted at the skull or skin? Brains learning together are literally growing together. Put another way, higher level cognitions adequate to social practices require simultaneous and synchronized operations across multiple brains that have grown together through shared experiences, communications, and practices. People can do so many things by themselves because they grew up doing so much with others. Localizing the "real" cognition or the "genuine" agency in just brains taken singly is inadequate both to the natural development of brains and the social psychology of cognition.

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