

## Neo-pragmatism and enactive intentionality<sup>1</sup>

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Enactive approaches in cognitive science propose that perception, and more generally cognitive experience, are strongly mediated by embodied (sensory-motor) processes, and that our primary experience of the world is action-oriented or pragmatic (Noë 2004; Thompson 2007; Varela et al. 1991). Extended mind theorists propose that cognition supervenes on embodied and environmental processes such as gestures and the use of various technologies (Clark 2008; Clark and Chalmers 1998; Menary 2010). Both enactive and extended conceptions of cognition suggest that the mind is not “in the head” – that cognitive processes are distributed over brain, body and environment – but they also differ on a number of issues. Extended mind theorists defend a functionalist account of cognition and downplay the role of the body (e.g., Clark 2008), and they argue that cognition and action can involve mental representations (e.g., Clark 1997; Clark and Grush 1999; Rowlands 2006; Wheeler 2005). In contrast, enactive theorists argue for radical embodiment (e.g., Thompson and Varela 2001) and defend an anti-representationist view (e.g., Gallagher 2008b; Hutto, in press; Thompson 2007). There are also debates about how to define the boundaries, or lack of boundaries, involved in cognitive processes (e.g., Di Paolo 2009; Wheeler 2008).

In this chapter we do not propose to resolve all of these issues. Rather, we intend to address the following question: Can enactive and extended conceptions of the mind agree on a model of intentionality? We explore several conceptions of intentionality in order to ask which conception of intentionality best supports the new concept of mind implied by both the enactive and the extended views. We argue (1) that although both enactive and extended views champion a non-Cartesian, non-internalist conception of mind, we only start to see what this conception of mind is when we adopt an enactivist conception of intentionality; (2) only by adopting this model of intentionality will the

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proponents of the extended mind hypothesis be able to fend off those critics that insist on defining the “mark of the mental” in terms of non-derivative (narrow or internal) content (e.g. Adams and Aizawa 2001; 2009); and (3) working out this model of intentionality requires resolutions to a number of debates in the area of social cognition (sometimes called ‘theory of mind’ [ToM]).

## **1. Intentionality as a character of mental states**

The concept of intentionality is a complicated one, with a long history. Both the phenomenological and the analytic tradition tend to point to Brentano’s definition of intentionality as a starting point. Brentano, in turn, took his orientation from medieval sources.

Every mental phenomenon is characterized by what the Scholastics of the Middle Ages called the intentional (or mental) inexistence of an object, and what we might call, though not wholly unambiguously, reference to a content, direction toward an object (which is not to be understood here as meaning a thing), or immanent objectivity. Every mental phenomenon includes something as object within itself... (Brentano 2008, 88).

In this regard, Brentano understood intentionality to be the mark of the mental, and understood the mental in terms of a psychological act, its content, and the relation between them.

In some ways this view shares an internalist bias with what Haugeland (1990) calls a neo-Cartesian concept of intentionality. Such a view is defended by Horgan and Kriegel, and they refer to it as a “traditional, strongly internalist, broadly Cartesian picture of the mind” (p. 2008, 353). On this view the mind is in some way discontinuous with everything around it, but at the same time, naturalistically continuous with the brain. Horgan and Kriegel (2008) summarize this internalist view in six propositions:

1. The mind exhibits intentionality in virtue of its nature as phenomenal consciousness (intrinsic phenomenal intentionality).
2. Intentional content is narrow – i.e., internal, and could be instantiated in a brain in a vat, reflecting the fact that prototypical mental states have strict neural correlates.
3. Intentionality is subjective – access is given only to the experiencing subject.
4. Intentionality applies to both sensory and cognitive states.
5. Intentionality is non-derivative.
6. Intentionality is the mark of the mental.

This is clearly a view that locates intentionality in the head and limits it to traditionally defined internal mental states. This neo-Cartesian internalist framework identifies non-derived intentionality as the mark of the mental (Horgan and Kriegel 2008; also Horgan and Tienson 2002), an idea posed against the extended mind hypothesis by those who insist that the mind cannot extend outside of brain-bound processes. Thus, Adams and

Aizawa attempt to answer the question of where cognition stops and something non-cognitive begins by appealing to non-derived content as the mark of the mental (Adams and Aizawa 2001; 2009).

The concept of non-derived content, however, is not on settled ground. In this regard, there are disagreements that would apply to both the Brentanian and the neo-Cartesian concept concerning what is or is not intentional. Some, including Husserl (e.g., 1982, §36) and Searle (1992), have argued that not all mental experience is intentional. For example, some theorists claim that the experience of pain is a mental experience, but is not necessarily intentional (see, e.g., Crane 1998). Moreover, as Shapiro (in press) notes, “there is today no received theory of how original content comes to be in the first place.”

Furthermore, as an internalist argument against the extended mind hypothesis the question about what constitutes the mark of the mental, or what constitutes non-derived intentionality, is not a question that can be answered without begging the question of whether some cognitive processes are extended. That is, it seems possible that there could be a theory of non-derived intentionality consistent with the very different conception of the mind suggested by enactive and extended accounts of cognition.

## **2. Intentionality as a characteristic of agents**

The discussion of intentionality goes beyond a narrow discussion of mental state intentionality in both phenomenology and analytic philosophy of mind. In phenomenology, Husserl introduces the concept of operative (*fungierende*) intentionality in contrast to act intentionality (the mental state concept). The concept of operative intentionality attempts to capture the fact that the experiencing agent is intentionally engaged with the world through actions and projects that are not reducible to simple mental states, but involve what Husserl refers to as bodily intentionality (1977, §39). Merleau-Ponty (1962) takes up the analysis of intentionality just at this point. Actions are intentional, not only in the sense that they are willed, but also in the sense that they are directed at some goal or project. Moreover, this intentionality of action is something that can be perceptually understood by others. We return to this concept of operative intentionality later in the paper.

Likewise, in analytic philosophy of mind, we find discussions of agent intentionality that go beyond the question of mental state intentionality. Haugeland (1990), for example, contrasts the neo-Cartesian concept of intentionality to neo-behaviorist and neo-pragmatist conceptions. Both the neo-behaviorist and the neo-pragmatist conceptions of intentionality share a common feature: an externalist view that intentionality is something that we can discern in behavior and is not necessarily hidden away inside the head. In this respect they seem to be good candidates for the kind of intentionality needed to support the enactive and extended concepts of mind. We argue below (in the next two sections, respectively), for different reasons, both the neo-behaviorist and, on its own, the neo-pragmatist versions fall short.

## 2.1 Neo-behaviorism and theory of mind

The neo-behaviorist view is exemplified in Dennett's intentional stance, which he explains in terms of observing an agent engaged in rational behavior, and on that basis ascribing intentionality, i.e., treating the agent as someone "who harbors beliefs and desires and other mental states that exhibit intentionality or 'aboutness', and whose actions can be explained (or predicted) on the basis of the content of these states" (1991, 76).<sup>2</sup> In this account we can immediately see two things: first, that this conception of an intentional agent (or system) starts with considerations about the agent's behavior, but also refers us back to questions about mental state intentionality. Second, that this conception relates intentionality to social cognition, a relation we will highlight as our discussion proceeds. Phillip Pettit provides a similar explanation: intentional agents "are agents that engage with their environment in such a way that we ascribe beliefs and desires to them" (1996, 10). We ascribe beliefs and desires to them on the basis of observed regularities in their behavior, most commonly identified as "rational regularities" (11). Furthermore, defenders of the extended mind hypothesis, including Clark and Chalmers (1998) and Clark (2008), seem to adopt this conception of intentionality.<sup>3</sup> For them, it is reasonable to take an agent's mind as extended only insofar as we gain explanatory and predictive advantage by doing so, that is by ascribing mental states that require external physical vehicles for their realization, in order to explain action.

Let's note first that, in contrast to claims made by the neo-behaviorist model, in our actual practice of intentional ascription, we do not always treat another agent's meaningful action as a rational behavior, or as an instrumental action directed at a particular desired goal. If, for example, we see someone gesturing or nodding their head as they listen to a lecture, we do not fail to attribute a certain intentionality to them in this respect, even though we do not always understand the intentionality expressed in gesturing or head-nodding as motivated by specific beliefs (e.g., about the meaning of the gesturing or head-nodding) or desires (e.g., to impress the lecturer) (Miyahara, in press).

Another example involves the intentionality associated with sexuality. As Merleau-Ponty puts it:

Erotic perception is not a *cogitatio* aiming at a *cogitatum*; through one body it aims at another body, and it is carried out in the world, not in a consciousness. A spectacle has sexual signification for me, not when I represent, even confusedly, its possible relation to the sexual organs or to states of pleasure, but when it exists for

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<sup>2</sup> Here is his original formulation. "Here is how it works: first you decide to treat the object whose behavior is to be predicted as a rational agent; then you figure out what beliefs that agent ought to have, given its place in the world and its purpose. Then you figure out what desires it ought to have, on the same considerations, and finally you predict that this rational agent will act to further its goals in the light of its beliefs. A little practical reasoning from the chosen set of beliefs and desires will in most instances yield a decision about what the agent ought to do; that is what you predict the agent will do" (Dennett 1987, p. 17)

<sup>3</sup> The neo-behaviorist view is quite consistent with the functionalist position defended by Clark. Indeed, Horgan and Kriegel (2008) contend that the neo-behaviorist position would be the only viable option for the extended mind hypothesis, although more generally they think the extended mind hypothesis is not viable.

my body, for this power which is always ready to form the given stimuli into an erotic situation and to behave therein in a sexual way. (Merleau-Ponty 1962, 139).

Erotic intentionality is not a matter of instrumental rationality, and not reducible to a set of mental states, propositional attitudes like beliefs or desires, or even to a set of observable behaviors, or to some attributional/inferential link between the two. It's a form of intentionality that seemingly goes beyond the terms of folk-psychology.

As the descriptions of the intentional stance suggest, neo-behaviorists rely on a commonsense or folk psychology involving mental states (themselves understood in terms of mental state intentionality) as the basis for ascribing intentionality to the agent. In addition, however, neo-behaviorism asserts that we take an agent as having intentionality "only in relation to the strategies of someone who is trying to explain and predict its behavior" (Dennett 1971, 87). Accordingly, an agent actually has intentionality only relative to it being ascribed by an external observer, and this fails to explain how an agent might have intentionality on its own (or ascribe intentionality to itself) without the presence of an observer (or without trying to explain and predict its own behavior). This, however, apparently goes against our commonsense psychology. For we do usually think we can have intentional states on our own. Moreover, this inability to explain how an agent might have intentionality on its own seemingly forces neo-behaviorists to reintroduce the concept of non-derived intentionality. This problem becomes salient if we ask how the external observer, in virtue of whom an agent has intentionality, acquires the intention to explain and predict the agent's behavior. On the neo-behaviorist logic, to answer this question, we must appeal to another observer, who intends to explain and predict the first observer's behaviors. The intentionality of the second observer, however, would require a third observer, and so on. As Adams and Aizawa (2001) point out, for the neo-behaviorist account to get off the ground, it would be more reasonable to suppose an internalist story of non-derived intentionality for the first observer, or the agent whose intentionality was originally in question.

More generally, with respect to ToM and social cognition, the neo-behaviorist model of intentionality goes hand in hand with a theory theory (TT) approach, that is, an approach that conceives of intersubjective understanding as a form of inference based on folk psychology. There are, however, a number of objections that can be raised against the TT view (see Gallagher 2005; Goldman 2006). If, for example, as on some views of TT, mindreading is both a conscious process and pervasive in our everyday understanding of others, then we should be able to find phenomenological evidence for the inferential process that relies on folk psychology. As a brief reflection should tell us, however, when we are engaged with others in our everyday situations, we rarely find ourselves making such mindreading inferences to mental states. Even if, alternatively, we think of mindreading inferences as non-conscious, TT still has difficulty explaining how young infants are able to interact with others in ways that suggest that they have a practical understanding of emotions and intentions, since it is unlikely that they have the cognitive capacities for theoretical inference.<sup>4</sup>

Finally, it is noteworthy that this approach to understanding intentionality, and the TT approach to social cognition, still depend on a rather standard model of the mind as a

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<sup>4</sup> See, for example, recent false-belief experiments in infants, 15 months of age and younger (e.g., Baillargeon, Scott and He 2010), discussed below.

set of mental states “in the head,” and hidden behind behavior. Such hidden mental processes are said to constitute the canonical type of explanation of the intentional behaviors that we observe. The trace of this idea is obvious in the extended mind theorists' appeal to the “Parity Principle” (Clark and Chalmers 1998; Clark 2008) or “functional isomorphism” (Clark 1997) in support of the extended mind hypothesis. The principle is that we should take a non-neural item (a body part or something in the environment) as a part of the vehicle of cognition only to the extent that the functional contribution it makes to a cognitive activity is isomorphic or similar enough to a contribution that could be made by some processes in the brain. A notebook containing information which guides an agent's behavior, for example, constitutes a part of the agent's mind because the function it plays is on a par with the function biological memory might play (Clark and Chalmers 1998). Contrary to their intention, the Parity Principle invited troubling arguments against the extended mind hypothesis. Adams and Aizawa (2001), for example, rejects the hypothesis, while endorsing the Parity Principle, by arguing that, as a matter of empirical fact, external processes are functionally dissimilar to internal, neural processes (see also Rupert 2004 for a similar argument). The extended mind theorists, however, are concerned to establish the similarity between the external (non-neural) and internal (neural) items only because they still hang on to the canonical conception of the mind as “in the head.” Thus, whether or not the extended mind theorists committed to the neo-behaviorist conception of intentionality can provide viable responses to such criticisms, this is not the concept of intentionality that will work for enactive and extended mind theorists who want to push toward an alternative conception of mind.<sup>5</sup>

## 2.2 Neo-pragmatism<sup>6</sup>

In contrast to neo-behaviorists, some neo-pragmatists, like Brandom (1994, 2000), appeal to an account of intentionality that depends on social/normative concepts. Brandom explains the concept of intentionality in terms of what he calls the practice of *deontic scorekeeping*, i.e., our mutual implicit practice of keeping track of each other's and our own actions in terms of *normative status* (1994, Ch. 3). On this view we understand the intentionality of the other implicitly in terms of certain commitments or entitlements specified by social norms, although we do not always *acknowledge* such normative statuses *explicitly*. If, for example, I promise to give you a wake-up call tomorrow

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<sup>5</sup> Adams and Aizawa (2009) state that we can understand “why even transcranialists [i.e., extended and enactive mind theorists] maintain that cognition extends from brains into the extraorganismal world rather than from the extraorganismal world into brains” (92) based on the fact that non-neural external processes are actually non-cognitive. We agree with them that it is misleading for the extended and enactive mind theorists to describe the mind as *extending from brains into the world*. We disagree with them that such misleading descriptions constitute evidence in support of the standard model of the mind as “in the head”; rather, such descriptions reflect remnants of the old model in the extended mind literature, which need to be removed in order to fully appreciate the potential of the claim.

<sup>6</sup> In this section we consider one version of neo-pragmatism, as found in Brandom and a few other theorists. There are a number of different contemporary versions of neo-pragmatism being developed, as in the work of Johnson (2008), Schulkin (2008) and others. Our focus on Brandom is purely pragmatic; he directly addresses the issue of intentionality in a way that facilitates our analysis here.

morning at 7, neither you or I necessarily think explicitly of this in terms of my loss of entitlement to sleep until 9. However, we *keep score* or *keep track* of such things *implicitly*, and this is revealed in the way we act. Thus, if I oversleep until 9 and do not fulfill the promise, I will apologize and you will blame me because I *should not* have slept until 9. This interaction reveals that we were both tracking my normative status implicitly.

Accordingly, we ascribe intentionality to an entity who is capable of having a particular set of commitments and entitlements, namely, *inferentially articulated* or *discursive* commitments and entitlements instituted by social linguistic norms—that is, the implicit norms that determine the social appropriateness of our linguistic practices including inferential reasonings. In this regard Brandom thinks it's “norms all the way down” and that “...only communities, not individuals, can be interpreted as having original intentionality. [...T]he practices that institute the sort of normative status characteristic of intentional states must be *social practices*” (1994, 61). That is, we track, and occasionally acknowledge, other people's intentionality in virtue of what they are doing and saying, what they are expected to do or say, what roles they play, what kind of place and time it is and what such factors mean to us in the shared social situation, rather than by somehow looking for mental states hidden behind their behaviors.<sup>7</sup> We ascribe intentionality to actions to the extent that we have a practical grasp on their socially instituted significance.

On this basis, we have no problem in ascribing intentionality to gestures and head nods. According to neo-pragmatism, gestures are just another kind of the doing by which, by virtue of their socially instituted significance, people keep track of one another's normative statuses. In understanding another's head-nodding, for example, we attribute to that person a discursive commitment to the claim that the lecturer made, which he or she may or may not explicitly acknowledge, instead of positing a belief or internal mental state about the content of the claim. Furthermore, since we can keep track of our *own* normative status by relying on the social significance of our own circumstance, typically including our own previous sayings and doings, there is no problem for the possibility of having intentionality on one's own, as a social agent.

Thus, the neo-pragmatist account of intentionality avoids some of the problems found in the neo-behaviorist account. Neo-pragmatists, however, run into a different problem, namely, in their attempt to account for our commonsense ability to recognize intentionality in the behavior of a variety of non- or pre-social entities, e.g., geometrical figures moving in certain patterns on a computer screen, non-human animals, and human

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<sup>7</sup> Cash (2010) describes it as follows: “On this normative view ... the paradigmatic cases of such ascriptions are made by another member of the agent's linguistic and normative community; the ascriptions abide by, and are justified by, the norms of that community's practice of giving intentional states as reasons for actions. This practice is firmly situated in and supported by that community's shared, public language, with its norms regulating the appropriate uses of words to give content to intentional states. ... This practice constrains what ascriptions an observer is licensed to ascribe according to the agent's behavior. But they also normatively constrain the further actions of the agent. Agents who recognize that observers are licensed to ascribe particular intentional states to them ought to take themselves to be committed to further actions consistent with those intentional states. If I say to you that I intend to go for a walk, I should recognize that this utterance licenses you to ascribe to me the intention to go for a walk; I have licensed you to expect me to go for a walk, and thus I have placed myself under a commitment (*ceteris paribus*) to go for a walk.”

infants.<sup>8</sup> According to neo-pragmatism, something is an intentional agent only if it acts according to norms that are socially based. Certain insulting gestures, for example, are culturally relative, and we should not understand someone from a different culture who accidentally made an insulting gesture to be acting as an insulting intentional agent. More generally, if a creature (e.g., a non-human animal) *completely* lacks understanding of social norms, and is not expected to act in accordance with such norms, it seems that the ascribing of intentionality itself would be inappropriate. And yet we do ascribe intentionality to animals, and others who lack understanding of social norms (e.g., pre-social infants). Empirical studies show that we also tend to see intentionality even in geometric figures if they make particular kinds of movements (Michotte 1963; Heider and Simmel 1944). Neo-pragmatists, then, seemingly fail to explain our everyday practices of ascribing intentionality to such creatures.

One suggestion for resolving this problem points to a more basic issue. Cash (2008, 2009) suggests that on a neo-pragmatist account, we can ascribe intentionality to animals and infants “*based on the similarity of their movement to the kind of actions, which if performed by a person would entitle us to ascribe such intentional states as reasons*” (2008, 101; *emphasis added*). That is, neo-pragmatists can ascribe intentionality to a non-social entity, but only by recognizing some kind of similarity between that entity’s behavior and the behavior of a socialized human. What this proposal entails, however, is not clear. Moreover, this lack of clarity extends back to the processes that are involved in ascribing intentionality to humans as well. That is, neo-pragmatism doesn’t make it clear how things work even in the human case – how precisely we recognize agents to be acting in accordance with social norms.

There seem to be two possibilities in the case of ascribing intentionality to non-human entities, if, as Cash indicates, similarity is the operative concept. The first would be a form of pattern recognition plus inference from analogy. That is, we might take certain non-humans in motion as having intentionality by detecting a common dynamic pattern between their movements and behaviors displayed by other people. This solution fails, however, based on the simple fact that at least in some instances where we ascribe intentionality to animals or moving geometrical figures on a computer screen, there is no behavioral similarity to humans involved (Miyahara, in press). Alternatively, if we take ourselves as the person or model on which to base the comparison, we can understand the emphasis on similarity as a move in the direction of the simulation theory of social cognition (ST). Goldman, for example, calls the following view, as described by Dennett, a version of ST: “the view that when we attribute beliefs and other intentional states to others, we do this by comparing them to ourselves, by projecting ourselves into their states of mind” (Dennett 1987, 98-99; see Goldman 2006, 57).

ST contends that we rely, not on folk psychological inferences, but on modeling the other person’s mental states using our own minds to simulate what we would do if we were in their shoes. Mindreading on this view involves the projection of our own first-person pretend beliefs and desires onto the minds of others based on a similarity that we see between their actions and our own.

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<sup>8</sup> As Miyahara (in press) points out, this goes against Clark’s commitment to the possibility of cognition in non-human animals or the “biological mind”(1997, 1). In this regard, he has good reason to adopt the neo-behaviorist concept of intentionality rather than the neo-pragmatic one.

Some of the same objections raised against explicit versions of TT can be raised against explicit versions of ST. That is, there is no phenomenological evidence that we follow simulation routines in our everyday social interactions; we rarely find ourselves mindreading, either by inference or by simulation. Furthermore, it is unlikely that infants have the cognitive capacities for what Goldman (2006) describes as a high-level or introspective simulation, and yet they have some practical understanding of others.

One way to avoid these objections is to appeal to neural ST. The recent neuroscience of mirror neurons (MNs) has motivated a reconception of simulation (see, Gallese and Goldman 1998; Rizzolatti et al. 2001). According to this view, MNs are characterized as simulating the actions of others since they are specific neurons that are activated in two circumstances: either when I perform an action or when I see the other person perform an action. In this regard, the claim is that the observer's motor system goes into a matching state with the observed action of others. Simulation on this view would be equivalent to my system *matching* or establishing a *similarity* with the system that I observe – sometimes referred to as the matching hypothesis (Goldman 2006; Rizzolatti, et al. 2001). Mindreading, or at least action comprehension, would be the result of an automatic mechanism that works entirely on a subpersonal level. The fact that these processes are non-conscious (not explicit) suggests that phenomenology is not in a position to offer evidence for or against simulation. Furthermore, since these processes are automatic, and do not involve higher cognitive function, they can explain how infants can simulate the actions of others.

This move to neural ST looks promising for neo-pragmatism since it focuses on action understanding and treats intention as something implicit in the action itself. Theoretically, one can certainly stop short of stronger claims about MNs being a basis for mindreading, rather than just action understanding. If neural ST avoids some objections, however, it fails to avoid others. With respect to the issue of intention attribution to non-human entities, MN activation is limited to very few cases of cross-species action perception – that is, MNs cannot explain why we would attribute intentions to dogs, cats, roaches, geometrical figures etc., since MNs are not activated in these cases, although they may explain intention attribution to monkeys and apes (see Buccino et al. 2004). Supposedly, the bodily action similarity is strong enough between humans and monkeys. Outside of these limited cases, we run into an objection similar to the one about simple pattern recognition – insufficient behavioral (bodily action) similarity.

Other objections arise if we take neural ST as a model of human, intersubjective understanding (see Gallagher 2007). For example, on the standard definition simulation involves pretense (one system operates “as if” it were in the situation of the other system). MNs, however, are said to be neutral with respect to who the agent is (Gallese 2005). That is, they fire indifferently whether I am acting, or I am observing you acting. As a result, in the activation of MNs there is no distinction between self and other, a distinction which is necessary, but not sufficient, for pretense. Even if there were some basis in the MN activation for the self-other distinction (e.g., difference in firing rates for self-action vs observation), more than the self-other distinction, something corresponding to the “as if,” is needed for pretense. This issue has motivated the matching hypothesis, which involves a more minimal definition of simulation, i.e., simulation as simple matching (Goldman 2006; Rizzolatti et al. 2001). Neuroscientific research and several

recent experiments, however, show no matching activation between action-execution and action-observation for specific MNs (or MN areas).

Dinstein et al. (2008), for example, using the paper-scissors-rock game, show that in fact, in certain areas of the brain where MNs are thought to exist – specifically the *anterior intraparietal sulcus* (aIPS) – areas activated for producing a particular hand action are not activated for observing that hand action in another. For matching gestures, “distinctly different fMRI response patterns were generated by executed and observed movements in aIPS ... aIPS exhibits movement-selective responses during both observation and execution of movement, but ...the representations of observed and executed movements are fundamentally different from one another” (Dinstein et al. 2008). Another study (Catmur, Walsh, & Heyes 2007) shows that learning can work against matching. The experimenters trained subjects to move their fingers in a manner incongruent with an observed hand, for example, moving the little finger when they observed movement of the index finger. After training, magnetic evoked potentials (MEPs) were greater in the little finger when index finger movement was observed. “The important implication of this result is that study participants who exhibited incongruent MEP responses presumably did not mistake the perception of index finger movement for little finger movement...” (Hickok 2009, 1236). That is, the lack of matching in the motor system does not preempt some kind of recognition of what the other person is doing. More generally, Csibra (2005) points out that conservatively, between 21 and 45% of neurons identified as mirror neurons are sensitive to multiple types of action; of those activated by a single type of observed action, that action is not necessarily the same action defined by the motor properties of the neuron; approximately 60% of mirror neurons are “broadly congruent,” which means there may be some relation between the observed action(s) and their associated executed action, but not an exact match. Only about one-third of mirror neurons show a one-to-one congruence.<sup>9</sup> Newman-Norlund et al. (2007, 55) suggest that activation of the broadly congruent mirror neurons may represent a complementary action rather than a similar action. In that case they could not be simulations defined on the matching hypothesis (Gallagher 2008a).

From the neo-pragmatist perspective, even if we could set these problems aside, the simulation theory of social cognition, like TT, remains too closely tied to internalist models of intentionality. For example, ST shares two important assumptions with TT. First, both approaches assume that the problem of social cognition is best posed as one that involves mindreading – a capacity that allows us to address our lack of access to other minds, characterized as hidden mental states which explain their manifest behavior. If some proponents of neural ST sometimes move away from this mindreading model to focus on action understanding (e.g., Gallese 2009), many others take neural ST as a form of mindreading (e.g., Oberman and Ramachandran 2009) or a support for mindreading (e.g. Keysers and Gazzola 2009). This assumption goes against the neo-pragmatic claim that intentionality has a normative status specified by social norms, publicly accessible to

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<sup>9</sup> Csibra concludes: “With strongly unequal distribution of types of action or types of grip, one could find a relatively high proportion of good match between the [observed action vs executed action] domains even if there were no causal relation between them. Without such a statistical analysis, it remains uncertain whether the cells that satisfy the definition of 'mirror neurons' (i.e., the ones that discharge both with execution and observation of actions) do indeed have 'mirror properties' in the everyday use of this term (i.e., are generally activated by the same action in both domains)” (2005, 3).

other people as well as to the one to which intentionality belongs. Furthermore, we have already seen that extended mind theorists are confronted by difficult criticisms because of their failure to remove the trace of this internalist model from their argument for the extended mind hypothesis.

Second, and closely aligned with the first assumption: the assumption of methodological individualism.

*Methodological individualism:* the working assumption that access to knowledge about the minds of others depends on cognitive capabilities or mechanisms of an isolated individual, or on processes that take place inside an individual brain. (Froese and Gallagher, submitted)

In other words, for TT and ST, the solution has to come by some cognitive (“in the head”) operation (theoretical inference, introspective modeling, or neuronal process), or theory-of-mind mechanism (ToMM or MNs), that would allow us to grasp the other person’s mental states. Thus, both the attribution process and the intentionality attributed are narrowed down to the workings of internal mental states or brain states. According to neo-pragmatism, however, the cognitive understanding of others, or the explicit acknowledgement of intentionality is secondary, possible only on the background of implicit shared practices; the basic mode of understanding others is not supported by the individual cognitive capacities for acknowledging others' intention as such, but rather by actual or potential interaction with others in a socially appropriate way. Thus, according to neo-pragmatism, some agents (or pre-agents) may be capable of tracking another's intentionality in practice, while being unable to understand it in isolation from the other in question, without engaging in an actual social interaction, which is a possibility that methodological individualism shuts out right away.

These models of intentionality attribution and social cognition thus do not provide a good fit with either the neo-pragmatist view or the enactive or extended theories of cognition. What we propose in the following sections is a neo-pragmatist account of intentionality without simulation; a neo-pragmatism consistent with enactive, extended, externalist conceptions of mind.

### **3. Interaction theory and operative intentionality**

It may be helpful to summarize what we have done so far. We’re still searching for an account of intentionality consistent with the alternative concept of mind suggested by enactive and extended approaches. So far we have ruled out the Brentanian, the neo-Cartesian, and the neo-behaviorist views of intentionality for a variety of reasons. We have also ruled out analogical and simulationist versions of neo-pragmatism. We turn now to our main proposal, namely that the phenomenological conception of operative intentionality is consistent with neo-pragmatism, and, as we argue in this section, is supported by an alternative conception of social cognition known as interaction theory. Moreover, this conception of intentionality is enactive, and is precisely the view of intentionality needed by extended mind theorists to counter the argument concerning non-derived content and the mark of the mental.

The interaction theory of social cognition (IT) cites evidence from developmental psychology, phenomenology, and dynamic systems modeling to show that interaction and social contexts are important constitutional factors in social cognition – that is, that processes and events external to the individual – specifically, interactions themselves – have a transformative effect on individuals who engage in them (Gallagher 2001; 2005; Gallagher & Hutto 2007; Gallagher & Zahavi 2008; Ratcliffe 2007). This involves the concept of ‘strong interaction’ (Gallagher, in press; Froese and Gallagher, submitted), which we can define, following De Jaegher, Di Paolo, and Gallagher (2010):

*Strong Interaction:* a mutually engaged co-regulated coupling between at least two autonomous agents where the co-regulation and the coupling mutually affect each other, constituting a self-sustaining organization in the domain of relational dynamics.

It is beyond the scope of this chapter to present the full range of evidence for the notion of strong interaction. We can provide a brief summary of some of the evidence found in developmental studies, phenomenological and behavioral studies, and dynamic systems modeling.

#### *(a) Developmental studies*

IT appeals to evidence from developmental studies, starting with primary and secondary intersubjectivity (Trevarthen 1979; Trevarthen and Hubley 1978). Primary intersubjectivity consists of the innate or early-developing sensory-motor capacities that bring us into relation with others and allow us to interact with them. These capacities are manifested at the level of perceptual experience -- we *see* or more generally *perceive* in the other person’s bodily movements, gestures, facial expressions, eye direction, etc. what they intend and what they feel, and we respond with our own bodily movements, gestures, facial expressions, gaze, etc. From birth the infant is pulled into these interactive processes. This can be seen in the very early behavior of the newborn. Infants from birth are capable of perceiving and imitating facial gestures presented by another (Meltzoff and Moore 1977; 1994). Importantly, this kind of imitation is not an automatic or mechanical procedure; Csibra and Gergely (2009) have shown, for example, that the infant is more likely to imitate only if the other person is attending to it.

Primary intersubjectivity can be specified in more detail as the infant develops. At 2 months, for example, infants are able to follow the gaze of the other person, to see that the other person is looking in a certain direction, and to sense what the other person sees (which is sometimes the infant herself), in a way that throws the intention of the other person into relief (Baron-Cohen 1995; Maurer and Barrera 1981). In addition, second-person *interaction* is evidenced by the timing and emotional response of infants’ behavior. Infants “vocalize and gesture in a way that seems [affectively and temporally] ‘tuned’ to the vocalizations and gestures of the other person” (Gopnik and Meltzoff 1997, 131). Murray and Trevarthen (1985) have shown the importance of the mother’s live interaction with 2-month old infants in their double TV monitor experiment where mother and infant interact by means of a live television link. The infants engage in lively interaction in this situation. When presented with a recorded replay of their mother’s previous actions, however, they quickly disengage and become distracted and upset.

At 5-7 months, infants are able to detect correspondences between visual and auditory information that specify the expression of emotions (Walker 1982; Hobson 1993; 2002). At 6 months infants start to perceive grasping as goal directed, and at 10-11 months infants are able to parse some kinds of continuous action according to intentional boundaries (Baldwin and Baird 2001; Baird and Baldwin 2001; Woodward, & Sommerville 2000). They start to perceive various movements of the head, the mouth, the hands, and more general body movements as meaningful, goal-directed movements (Senju, Johnson and Csibra 2006).

By the end of the first year of life, infants have a non-mentalizing, perceptually-based, embodied and pragmatic understanding of the intentions and dispositions of other persons. With the advent of joint attention (at around 9 months) and secondary intersubjectivity (at around 1 year) infants start to use context and enter into situations of participatory sense-making (De Jaegher and Di Paolo 2007). That is, infants begin to co-constitute the meaning of the world in their interactions with others. They start to understand the world through their interactions with others, and they gain a more nuanced understanding of others by situating their actions in contexts that are defined by both pragmatic tasks and cultural practices.

Insights about secondary intersubjectivity have recently been complemented by a new line of evidence, namely spontaneous response tasks which test the ability of young infants to understand false beliefs (see Baillargeon et al. 2010 for a review). The experimenters suggest that series of such tasks show that infants can attribute to an agent a false belief about an object's location (e.g. Onishi and Baillargeon 2005; Southgate et al. 2007; Song et al. 2008; Träuble et al. 2010). In addition, the experiments have been extended to test and demonstrate infants' understanding of another's false perception of an object, and another's false belief about an object's identity (e.g. Baillargeon and Song 2008). While the design and interpretation of these studies is still largely determined by ToM approaches, which treat the infant as a detached and isolated observer, more interactive experimental designs are also starting to appear. For instance, in a study by Buttelmann, Carpenter and Tomasello (2009) it was found that 18-month-olds would try to practically help an experimenter retrieve a toy in a way that takes into account that the experimenter's previous actions were informed by a false belief about the hidden toy's location (see Southgate, Chevallier and Csibra 2010 for similar results). These studies indicate that the capacities for understanding context and social situations, and for understanding others in such situations, are closely intertwined with the ability to deploy social competences to engage with those situations and to interact with other agents.

#### *(b) Behavioral and phenomenological evidence*

Neither primary nor secondary intersubjectivity disappears after the first year of life. These are not stages that we leave behind, and they are not, as Greg Currie suggests, a set of precursor states "that underpin early intersubjective understanding, and *make way* for the development of later theorizing or simulation (2008, 212; emphasis added; cf. Baron-Cohen 1991; 1995). Rather, citing both behavioral and phenomenological evidence, IT argues that primary and secondary intersubjectivity are both operative in adult social engagements; the processes involved here don't "make way" for the purportedly more sophisticated mindreading processes – these embodied interactive processes continue to characterize our everyday encounters even as adults. That is, we continue to understand

others in strong interactional terms, facilitated by our recognition of facial expressions, gestures, postures, and actions as meaningful.

Scientific experiments bear this out. Point-light experiments (actors in the dark wearing point lights on their joints, presenting abstract physical patterns of emotional and action postures), for example, show that not only children (although not autistic children) but also adults perceive emotion even in movement that offers minimal information (Hobson and Lee 1999; Dittrich et al. 1996). Close analysis of facial expression, gesture and action in everyday contexts shows that as adults we continue to rely on embodied interactive abilities to understand the intentions and actions of others and to accomplish interactive tasks (Lindblom 2007; Lindblom and Ziemke 2007).

Accordingly, meaning and emotional significance is co-constituted in the interaction -- not in the private confines of one or the other's head. The analyses of social interactions in shared activities, in working together, in communicative practices, and so on, show that agents unconsciously coordinate their movements, gestures, and speech acts (Issartel et al. 2007; Kendon 1990; Lindblom 2007). In the contextualized practices of secondary intersubjectivity timing and emotional attunement continue to be important as we coordinate our perception-action sequences; our movements are coupled with changes in velocity, direction and intonation of the movements and utterances of the speaker.

Phenomenology also bears this out. A frequently heard objection is that phenomenology cannot tell us anything about sub-personal processes and so is irrelevant to explanations of social cognition (see, e.g., Spaulding 2010). If, however, social cognition is not something reducible to individual sub-personal processes, that is, if social cognition depends on interaction processes that are best understood on personal and *super*-personal levels of explanation, then phenomenology has some relevance. Furthermore, even if a phenomenological assessment of lived experience is insufficient by itself to make the case for interaction, the fact that it supports both the behavioral and developmental evidence suggests that phenomenological and enactive accounts may provide a better explanatory model than ToM, which lacks the coherence offered by an approach to the social which encompasses the first- and third-person perspectives within a framework of second-person engagement (e.g. Reddy & Morris 2004).

In this spirit, consider Merleau-Ponty's concept of intercorporeity. The evidence suggests that from birth the action of the infant and the perceived action of the other person are coded in the same "language," a cross-modal sensory-motor system that is directly attuned to the actions and gestures of other humans (Meltzoff and Moore 1994; Gallagher and Meltzoff 1996). Phenomenology suggests that in this kind of interaction there is a bodily intentionality distributed across the interacting agents, an intentionality that couldn't be realized without there being an actual interaction. Merleau-Ponty calls this 'intercorporeity', and characterizes it in this way: "between this phenomenal body of mine, and that of another as I see it from the outside, there exists an internal relation which causes the other to appear as the completion of the system" (1962, p. 352; see 1968: 141, 143). Intercorporeity involves a mutual influence of body schemas, but not as Gallese (2009; 2010) suggests, in an isomorphic format, where one mirrors, or maps the other's actions onto one's own motor representations. Rather, intercorporeity involves a reciprocal, dynamic and enactive response to the other's action, taking that action as an affordance for further action rather than an opportunity for replication (simulation). This

enactive approach offers an alternative (non-simulationist) interpretation of MN activation in the social cognition process (Gallagher 2008a). Consistent with the suggestion made by Newman-Norlund et al. (2007), activation of the broadly congruent mirror neurons may be preparatory for an enactive response rather than a matching action.

*(c) Dynamic systems modeling*

Dynamic systems modeling relies on the use of computer simulations, as found, for example, in the field of evolutionary robotics (e.g. Beer 2000; 2003; Harvey, et al. 2005). These models can serve as a useful technological supplementation of phenomenological methodology (Froese & Gallagher 2010). Theorists have used this approach to investigate minimally social behavior (Froese & Di Paolo 2010; Froese & Di Paolo, in press). Basing their model on Murray and Trevarthen's (1985) 'double TV monitor' contingency study (discussed above), Iizuka and Di Paolo (2007), for example, used an evolutionary robotics approach to show that the detection of social contingency emerges from the dynamics of the interaction process itself. In their simulation model the evolved agents successfully acquired the capacity to discriminate between 'live' (interactive) and 'recorded' (one-way, non-interactive) relations. Dynamic systems analysis demonstrates that this capacity cannot be reduced to the isolated individual agent, but that the dynamics of the interaction process itself play an essential role in enabling this behavior. When the agent attempts to interact with a non-responsive 'partner' whose movements are merely played back from a recording of a previously highly successful encounter, the interaction fails to materialize. Individual interactors do *not* achieve their performance by utilizing internal computational mechanisms, such as 'social contingency detection modules'. Rather, their successful performance constitutively depends on dynamical properties of their mutual coupling.

The evidence for interaction theory shows that social cognition is both dynamic and enactive in nature. On the enactive view, we engage with others in ways that depend on embodied sensorimotor processes. We do not first perceive non-intentional movements, and then make inferences to what they mean. We enactively perceive the actions and emotional expressions of others as a form of intentionality – i.e., as meaningful and directed. Enactive perception of others means that we see their emotional expressions and contextualized actions as meaningful in terms of how we might respond to or interact with them. Others present us with social affordances. Accordingly, our understanding of others is pragmatic and it references their actions in context: it is not indexed to Cartesian mental states that would explain their actions.

Another way to say this is that we ordinarily perceive another's intentionality in the form of "operative intentionality" rather than mental "act intentionality." As we indicated above, the concept of operative intentionality attempts to capture the fact that the experiencing agent is intentionally engaged with the world through actions and projects that are not reducible to simple mental states, but involve an intentionality that is motoric and bodily. Actions have intentionality because they are directed at some goal or project, and this is something that we can see in the actions of others. Operative intentionality is quite different from mental state (or act) intentionality, which is garnered in reflective inference or judgment (Merleau-Ponty 1962, xviii). The latter seems to be what we

appreciate when we try to explain or predict other's behaviors from a detached, observatory standpoint, or reflect upon others' behaviors rather than when we enactively engage with their intentional behavior. In contrast, we usually experience both others and ourselves in terms of operative intentionality, an intentionality “which brings about the natural and prepredicative unity of the world and of our lives, which appears more clearly ... in our visual field than in objective knowledge” (Merleau-Ponty 1962, xviii). With respect to social cognition, we normally perceive another's intentionality in terms of its appropriateness, its pragmatic and/or emotional value for our particular way of being, constituted by the particular goals or projects we have at the time, our implicit grasp on cultural norms, our social status, etc., rather than as reflecting inner mental states, or as constituting explanatory reasons for her further thoughts and actions.

Consider the following example (from Miyahara, in press). Suppose you are driving a car along a busy street and see a person restlessly looking left and right at the edge of the street where there are no crosswalks. You slow down a little in case he runs onto the street, or at least you ready yourself to press the brake pedal. If the passenger in the car with you asked you why you slowed down, you might answer that the person looked like he *wanted* to cross the road. In this reflective explanation it seems as if the person had been experienced in terms of his mental states, i.e., his *desire* to cross the road, which constitutes a reason for a further action of crossing the road. This, however, is a way of putting it that is forced by reflection. In fact, in the original action, placing your foot on the brake pedal just is part of what it means to experience the intentionality of the person at the edge of the road. As Merleau-Ponty puts it:

Our bodily experience of movement is not a particular case of knowledge; it provides us with a way of access to the world and the object, with a 'praktognosia', which has to be recognized as original and perhaps as primary. My body has its world, without having to make use of 'symbolic' or 'objectifying function' (1962, 140-141).

Making such bodily responses to the world or to an object, or in social contexts, to others, is a way of encountering such entities, which not only cannot be reduced to actions guided by the mediation of reasonings, but is also more primitive than the kind of recognition of the world that guides action only indirectly.

Enactive phenomenologists (and the interaction theory of social cognition) claim that this intersubjective and pragmatic understanding is the basic kind of understanding we have of others' and our own intentionality, and that this intentionality is primary and non-derived. On this notion of intentionality “the unity of the world, before being posited by knowledge in an explicit act of identification, is lived as already made or already there” (Merleau-Ponty 1962, xvii). Intentionality is determined by what the agent is doing and what the agent is ready to do – i.e., in the agent’s sensorimotor skills to cope with the situation at hand – and that holds for both stepping off a curb and stepping on the brake, and for any interaction that might follow.

#### 4. Enactive and Extended Minds

On the enactive view, one doesn't need to go to the level of mental states (propositional attitudes, beliefs, desires, inside the head) to encounter intentionality – operative intentionality is in the movement, in the action, in the environmentally attuned responses. This operative intentionality is the real (non-derived, primary) intentionality. Anything like attributed intentionality in terms of mental states is derived from this, and in most cases of everyday interaction, is unnecessary, redundant, and not necessarily real. Moreover, operative intentionality is clearly distributed over brain-body-environment—and so it is precisely the concept/theory of intentionality that enactive and extended accounts need.

This account is also consistent with the neo-pragmatist view. Indeed, IT shows us how to connect the very basic operative intentionality with the neo-pragmatist emphasis on social/normative aspects of behavior. Brandom makes the connection between operative intentionality and neo-pragmatism very clear.

A founding idea of pragmatism is that the most fundamental kind of intentionality (in the sense of directedness towards objects) is the *practical* involvement with objects exhibited by a sentient creature dealing skillfully with its world. (2008, 178).

Brandom pictures this intentionality as more basic than language-based “*semantic* intentionality,” and as involving feedback-governed processes that extend into the world, and which exhibit “a complexity [that] cannot in principle be specified without reference to the changes in the world that are both produced by the system's responses and responded to .... [Such practices] are ‘thick’, in the sense of essentially involving objects, events, and worldly states of affairs. Bits of the world are *incorporated* in such practices” (178).

It's clear, however, that (according to IT and developmental studies) this kind of intentionality (and the possibility of recognizing and attributing such intentionality to others) comes in earlier than any discussion of social norms might indicate, namely, in the intercorporeity of primary intersubjectivity. This is clearly prior to what develops as social/normative aspects of behavior later in childhood. IT understands this later development as primarily depending on communicative and narrative practices (Gallagher and Hutto 2008).

Again, my understanding of the other's intentionality is not based on the idea that I take myself as simulating the other, or as a perception of a normative similarity between my own actions and those of the other; it is rather that I see the other's actions as an affordance for my own possible action (which may be very different from hers); I see the other's action as inter-actionable or as calling forth a response on my part.

We note that this notion of intentionality also provides a better account of both erotic intentionality and our attribution of intentionality to non-humans. In erotic perception, which is not a *cogitatio* but a sexual significance for me “when it exists for my body,”

We discover both that sexual life is one more form of original intentionality, and also brings to view the vital origins of perception, motility and [symbolic] representation by basing all these "processes" on an intentional arc.... (Merleau-Ponty 1962, p. 157).

Erotic intentionality, like every instance of operative intentionality is not an 'I think that...' but an 'I can...' – it is whatever I recognize as something to which I could respond or interact erotically.

Consider again the attribution of intentionality to geometrical figures on a computer screen. I do not have to take them as *similar* to human, socially/normative actions to understand the intentionality which, in fact, is in their very movement. In fact, as long as it was programmed into them by human experimenters, their movement *is*, rather than merely similar to, a display of human action, just as a car cruising on the street is a display of the driver's intention, project, or commitment to drive the car. In both cases, I perceive the movement as something with which I could interact to some end. In the experimental case, one could easily picture a virtual reality where I, as a human subject, am in the scene with the geometrical objects, and where I could intervene e.g., to prevent one object from "chasing" another. This possibility for intervention on my part is what I see in their movement as meaningful, and what constitutes the basis for my attribution of intentionality. At the same time, this notion of intentionality can explain why I don't take those figures as true intentional agents: this feeling is due to the fact that they are presented in an environment where the possibility for interactions is largely restricted. On the one hand, I see the possibility for intervening, but, on the other hand, I know that I actually cannot intervene. It is this ambiguity that is reflected in my ambivalent appraisal of the figure's intentionality.

This enactive, neo-pragmatic, operative concept of intentionality is precisely the relevant concept needed to support the extended mind hypothesis. As Dewey made clear, long before the proponents of the extended mind formed their hypothesis, this is a pragmatic concept of mind: The mind "is formed out of commerce with the world and is set toward that world;" it should never be regarded as "something self-contained and self-enclosed" (1934, 269). That this concept of mind is intersubjective from the very start means that there is no mystery about where this non-derived intentionality comes from. It comes from the others with whom we interact, or more precisely, it is generated in our interaction. To the extent that we are all born into a community, our environment is full of intentional practices from the very beginning of our life. We develop and shape our intentionality by being initiated into this communal practice in virtue of actual interactions with other people, primarily with our caregivers, and in virtue of our innate or early-learned sensitivity to them or to opportunities for such interactions. This means that non-derived intentionality is not something that is first generated in my own isolated mind, or in brain processes that are not already directed to and by others. What Adams and Aizawa call non-derived content is surely derived from these ordinary interactive practices. In this regard, the mind is constituted by our enactive engagements with the environment, which is both social and physical; and intentionality means that we are "in-the-world," distributed over brain-body-environment, and extended in pragmatic and communicative practices that may further supervene on the tools, technologies and institutional practices through which we engage with the world.

## References

- Adams, F. and Aizawa, K. 2009. Why the mind is still in the head. In P. Robbins and M. Aydede (eds.), *The Cambridge Handbook for Situated Cognition* (pp. 78-95). New York: Cambridge University Press.
- Adams, F. and Aizawa, K. 2008. *The Bounds of Cognition*. Malden, MA: Blackwell.
- Adams, F. and Aizawa, K. 2001. The bounds of cognition. *Philosophical Psychology* 14 (1): 43-64.
- Baillargeon, R., Scott, R. M. & He, Z. 2010. False-belief understanding in infants. *Trends in Cognitive Sciences* 14 (3): 110-118.
- Baillargeon, R. & Song, H.-J. 2008. Infants' reasoning about others' false perceptions. *Developmental Psychology* 44 (6): 1789-1795.
- Baird, J. A., & Baldwin, D. A. 2001. Making sense of human behavior: Action parsing and intentional inference. In B. F. Malle, L. J. Moses, & D. A. Baldwin (Eds.), *Intentions and intentionality: Foundations of social cognition* (pp. 193-206). Cambridge, MA: MIT Press.
- Baldwin, D. A., & Baird, J. A. 2001. Discerning intentions in dynamic human action. *Trends in Cognitive Science* 5 (4): 171-178.
- Baron-Cohen, S. 1995. *Mindblindness: An Essay on Autism and Theory of Mind*. Cambridge, MA: MIT Press.
- Baron-Cohen, S. 1991. Precursors to a theory of mind: Understanding attention in others. In A. Whiten (Ed.), *Natural theories of mind: Evolution, development and simulation of everyday mindreading* (pp. 233-251). Oxford, UK: Basil Blackwell.
- Beer, R. D. 2000. Dynamical approaches to cognitive science. *Trends in Cognitive Sciences* 4 (3): 91-99.
- Beer, R. D. 2003. The dynamics of active categorical perception in an evolved model agent. *Adaptive Behavior* 11 (4): 209-243.
- Brandom, R. B. 1994. *Making It Explicit: Reasoning, Representing, and Discursive Commitment*. Cambridge, MA: Harvard University Press.
- Brandom, R. B. 2000. *Articulating Reasons: An Introduction to Inferentialism*. Cambridge, MA: Harvard University Press.
- Brandom, R. B. 2008. *Between Saying and Doing: Towards an Analytic Pragmatism*. Oxford: Oxford University Press.
- Brentano, F. 2008 [1862]. *Psychologie vom empirischen Standpunkte. Von der Klassifikation der psychischen Phänomene*. Ed. Mauro Antonelli. Heusenstamm: Ontos.
- Buccino, G., Lui, F., Canessa, N., Patteri, I., Lagravinese, G., Benuzzi, F., Porro, C. A., and Rizzolatti, G. 2004. Neural circuits involved in the recognition of actions performed by non-conspecifics: an fMRI study. *Journal of Cognitive Neuroscience* 16 (1): 114-126
- Buttelmann, D., Carpenter, M. & Tomasello, M. 2009. Eighteen-month-old infants show false belief understanding in an active helping paradigm. *Cognition* 112: 337-342.
- Cash, M. 2010. Extended cognition, personal responsibility, and relational autonomy. *Phenomenology and the Cognitive Sciences* 9 (4): 645-671

- Cash, M. 2009. Normativity is the mother of intentionality: Wittgenstein, normative practices and neurological representations. *New Ideas in Psychology* 27: 133-147.
- Cash, M. 2008. Thought and Oughts. *Philosophical Explorations* 11 (2): 93-119.
- Catmur, C. Walsh, V. and Heyes, C. 2007. Sensorimotor learning configures the human mirror system. *Current Biology* 17: 1527-1531
- Clark, A. 1997. *Being There: Putting Brain, Body and World Together Again*. Cambridge, MA: MIT Press.
- Clark, A. 2008. *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*. Oxford: Oxford University Press.
- Clark, A. And Chalmers, D. 1998. The extended mind. *Analysis* 58 (1): 7-19.
- Clark, A. and Grush, R. 1999. Towards a cognitive robotics. *Adaptive Behavior* 7 (1): 5-16.
- Crane, T. 1998. Intentionality as the mark of the mental. In A. O'Hear (ed.), *Contemporary Issues in the Philosophy of Mind*. Royal Institute of Philosophy Supplement (No. 43). Cambridge: Cambridge University Press.
- Csibra, G. 2005: Mirror neurons and action observation. Is simulation involved? *ESF Interdisciplines*. <http://www.interdisciplines.org/mirror/papers/>.
- Csibra, G. and Gergely, G. 2009: Natural pedagogy. *Trends in Cognitive Sciences* 13: 148-53.
- Currie, G. 2008. Some ways to understand people. *Philosophical Explorations* 11(3): 211-218.
- De Jaegher, H. & Di Paolo, E. A. 2007. Participatory sense-making: An enactive approach to social cognition. *Phenomenology and the Cognitive Sciences* 6 (4): 485-507.
- De Jaegher, H., Di Paolo, E. A. & Gallagher, S. 2010. Can social interaction constitute social cognition? *Trends in Cognitive Sciences* 14 (10): 441-447.
- Dennett, D. 1971. Intentional systems. *The Journal of Philosophy*, 68 (4), 87-106.
- Dennett, D. 1987. *The Intentional Stance*. Cambridge, MA: MIT Press.
- Dennett, 1991. *Consciousness Explained*. Boston: Little, Brown, and Co.
- Dewey, J. 1934. *Art as Experience*. New York: Perigee/Berkley.
- Dinstein, I., Thomas, C., Behrmann, M. and Heeger, D. J. 2008. A mirror up to nature. *Current Biology* 18 (1): R13-R18.
- Di Paolo, E. 2009. Extended life. *Topoi* 28 (1): 9-21.
- Dittrich, W.H., Troscianko, T., Lea, S.E.G and Morgan, D. 1996. Perception of emotion from dynamic point-light displays represented in dance. *Perception* 25: 727-38.
- Froese, T. & Di Paolo, E. A. 2010. Modeling social interaction as perceptual crossing: An investigation into the dynamics of the interaction process. *Connection Science* 22 (1): 43-68.
- Froese, T. & Di Paolo, E. A. (in press). Toward Minimally Social Behavior: Social Psychology Meets Evolutionary Robotics. *Advances in Artificial Life: Proc. of the 10<sup>th</sup> Euro. Conf. on Artificial Life*. Berlin, Germany: Springer.
- Froese, T. and Gallagher, S. (submitted). Being together: Strong interaction and dynamical systems theory.
- Froese, T. & Gallagher, S. 2010. Phenomenology and Artificial Life: Toward a Technological Supplementation of Phenomenological Methodology. *Husserl Studies*, 26 (2): 83-106.

- Gallagher, S. (in press). Narrative competency and the massive hermeneutical background. In P. Fairfield. *Education, Dialogue, and Hermeneutics*. New York: Continuum.
- Gallagher, S. 2008a. Are minimal representations still representations? *International Journal of Philosophical Studies* 16 (3): 351-369.
- Gallagher, S. 2008b. Neural simulation and social cognition. In J. A. Pineda (ed.), *Mirror Neuron Systems: The Role of Mirroring Processes in Social Cognition* (355-71). Totowa, NJ: Humana Press.
- Gallagher, S. 2007. Simulation trouble. *Social Neuroscience* 2 (3-4): 353-365.
- Gallagher, S. 2005. *How the Body Shapes the Mind*. New York, NY: Oxford University Press.
- Gallagher, S. 2001. The Practice of Mind: Theory, Simulation or Primary Interaction? *Journal of Consciousness Studies* 8 (5-7): 83-108.
- Gallagher, S. & Hutto, D. 2008. Understanding others through primary interaction and narrative practice. In J. Zlatev, T. P. Racine, C. Sinha & E. Itkonen (Eds.). *The Shared Mind: Perspectives on Intersubjectivity* (17-38). Amsterdam: John Benjamins.
- Gallagher, S. & Meltzoff, A. 1996. The earliest sense of self and others: Merleau-Ponty and recent developmental studies. *Philosophical Psychology* 9: 213-236.
- Gallagher, S. & Zahavi, D. 2008. *The Phenomenological Mind: An Introduction to Philosophy of Mind and Cognitive Science*. London, UK: Routledge.
- Gallese, V. 2010. Embodied Simulation and its Role in Intersubjectivity. In T. Fuchs, H. C. Sattel & P. Henningsen (Eds.), *The Embodied Self: Dimensions, Coherence and Disorders* (pp. 78-92). Stuttgart, Germany: Schattauer.
- Gallese, V. 2009. The Two Sides of Mimesis: Girard's Mimetic Theory, Embodied Simulation and Social Identification. *Journal of Consciousness Studies* 16 (4): 21-44.
- Gallese, V. 2005. 'Being like me': Self-other identity, mirror neurons and empathy. In S. Hurley and N. Chater (eds.), *Perspectives on Imitation I* (pp. 101-118). Cambridge, MA: MIT Press.
- Gallese, V., & Goldman, A. 1998. Mirror neurons and the simulation theory of mind-reading. *Trends in Cognitive Sciences* 2: 493-501.
- Goldman, A. I. 2006. *Simulating Minds: The Philosophy, Psychology, and Neuroscience of Mindreading*. New York: Oxford University Press.
- Gopnik, A. & Meltzoff, A. N. 1996. *Words, Thoughts, and Theories*. Cambridge, MA: MIT Press.
- Harvey, I., Di Paolo, E.A., Wood, R., Quinn, M. & Tuci, E. A. 2005. Evolutionary Robotics: A new scientific tool for studying cognition. *Artificial Life* 11 (1-2): 79-98.
- Haugeland, J. 1990. Intentionality all-stars. *Philosophical Perspectives* 4: 383-427. Reprinted in J. Haugeland, *Having Thought: Essays in the Metaphysics of Mind* (pp. 127-170). Cambridge, MA: Harvard University Press.
- Heider, F. and Simmel, M. 1944. An experimental study of apparent behavior. *The American Journal of Psychology*, 57 (2), 243-259.
- Hickok G. 2009. Eight problems for the mirror neuron theory of action understanding in monkeys and humans. *J Cogn Neurosci* 21 (7): 1229-1243.
- Hobson, P. 2002. *The Cradle of Thought*. London: Macmillan
- Hobson, P. 1993. The emotional origins of social understanding. *Philosophical Psychology* 6: 227-249.

- Hobson, P. and Lee, A. 1999. Imitation and identification in autism. *Journal of Child Psychology and Psychiatry* 40: 649-59.
- Horgan, T. E. and Kriegel, U. 2008. Phenomenal intentionality meets the extended mind. *The Monist* 91: 353-380
- Horgan, T. E. and Tienson, J. L. 2002. The intentionality of phenomenology and the phenomenology of intentionality. In D. J. Chalmers (ed.), *Philosophy of Mind: Classical and Contemporary Readings*. Oxford: Oxford University Press.
- Husserl, E. 1982. [1913]. *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy — First Book*, trans. F. Kersten. The Hague: Martinus Nijhoff.
- Husserl, E. 1977. *Phenomenological Psychology*. Trans. J. Scanlon. The Hague: Martinus Nijhoff.
- Hutto, D. (in press). Philosophy of mind's new lease on life: Autopoietic enactivism meets teleosemiotics. *Journal of Consciousness Studies* (Spring 2011).
- Iizuka, H. & Di Paolo, E. A. 2007. Minimal agency detection of embodied agents. In F. Almeida e Costa, L. M. Rocha, E. Costa, I. Harvey & A. Coutinho (Eds.), *Advances in Artificial Life: Proc. of the 9<sup>th</sup> Euro. Conf. on Artificial Life* (pp. 485-494). Berlin, Germany: Springer.
- Issartel, J., Marin, L. & Cadopi, M. 2007. Unintended interpersonal co-ordination: 'can we march to the beat of our own drum?' *Neuroscience Letters* 411 (3): 174-179.
- Johnson, M. 2008. *The Meaning of the Body: Aesthetics of Human Understanding*. Chicago: University of Chicago Press.
- Kendon, A. 1990. *Conducting Interaction: Patterns of behavior in focused encounters*. Cambridge, UK: Cambridge University Press.
- Keysers, C. and Gazzola, V. 2006. Towards a unifying neural theory of social cognition. In S. Anders, G. Ende, M. Junghofer, and J. Kissler (eds.), *Understanding Emotions* (379-402). Amsterdam: Elsevier.
- Lindblom, J. 2007. Minding the Body – Interacting socially through embodied action. Dissertation, University of Linköping and University of Skövde.
- Lindblom, J. & Ziemke, T. 2008. Interacting socially through embodied action. In F. Morganti, A. Carassa & G. Riva (Eds.), *Enacting Intersubjectivity: A Cognitive and Social Perspective on the Study of Interactions* (pp. 49-63). Amsterdam, Netherlands: IOS Press.
- Meltzoff, A. N., & Moore, M. K. 1994. Imitation, memory, and the representation of persons. *Infant Behavior and Development* 17: 83-99.
- Meltzoff, A. N. & Moore, M. K. 1977. Imitation of facial and manual gestures by human neonates. *Science* 198: 75-78.
- Menary, R. (ed.). 2010. *The Extended Mind*. Cambridge, MA: MIT Press.
- Merleau-Ponty, M. 1968. *The Visible and the Invisible*, trans. A. Lingis. Evanston: Northwestern University Press.
- Merleau-Ponty, M. 1962. [1945]. *Phenomenology of Perception*, trans. C. Smith. London: Routledge and Kegan Paul.
- Michotte, A. 1963. *The Perception of Causality*, trans. T. Miles and E. Miles. New York: Basic Books.
- Maurer, D. and Barrera, M. E. 1981. Infants' perception of natural and distorted arrangements of a schematic face. *Child Development* 52(1): 196-202.

- Miyahara, K. (in press). Neo-pragmatic intentionality and enactive perception: A compromise between extended and enactive minds. *Phenomenology and the Cognitive Sciences*.
- Murray, L. & Trevarthen, C. 1985. Emotional regulations of interactions between two-month-olds and their mothers. In T. M. Field & N. A. Fox (Eds.), *Social perception in infants* (pp. 177-197). Norwood, NJ: Ablex Publishing.
- Newman-Norlund, R.D. Noordzij, M.L. Meulenbroek, R.G.J and Bekkering, H. 2007. Exploring the brain basis of joint attention: Co-ordination of actions, goals and intentions. *Social Neuroscience* 2 (1): 48-65.
- Noë, A. 2004. *Action in Perception*. Cambridge, MA: MIT Press.
- Oberman, L. M., & Ramachandran, V. S. 2007. The simulating social mind: The role of the mirror neuron system and simulation in the social and communicative deficits of autism spectrum disorders. *Psychological Bulletin* 133(2): 310–327.
- Onishi, K.H., & Baillargeon, R. 2005: Do 15-month-old infants understand false beliefs? *Science* 308: 255–258.
- Pettit, P. 1996. *The Common Mind*. Oxford: Oxford University Press.
- Ratcliffe, M. 2007. *Rethinking Commonsense Psychology: A Critique of Folk Psychology, Theory of Mind and Simulation*. Basingstoke: Palgrave Macmillan.
- Reddy, V. & Morris, P. 2004. Participants don't need theories: Knowing minds in engagement. *Theory & Psychology* 14 (5): 647-665.
- Rizzolatti, G., Fogassi, L. & Gallese, V. 2001. Neurophysiological mechanisms underlying the understanding and imitation of action. *Nature Reviews Neuroscience* 2: 661-670.
- Rowlands, M. 2006. *Body Language*. Cambridge, MA: MIT Press.
- Rupert, R. 2004. Challenges to the hypothesis of extended cognition. *The Journal of Philosophy* 101 (8): 389-428.
- Schulkin, J. 2008. *Cognitive Adaptation: A Pragmatist Perspective*. Cambridge: Cambridge University Press.
- Searle, J. 1992. *The Rediscovery of the Mind*. Cambridge, MA: MIT Press.
- Senju, A., Johnson, M. H., & Csibra, G. 2006. The development and neural basis of referential gaze perception. *Social Neuroscience* 1 (3–4): 220–234.
- Shapiro, L. (in press). Review of Fred Adams and Ken Aizawa, *The Bounds of Cognition* (Malden, MA: Blackwell, 2008). *Phenomenology and the Cognitive Sciences*.
- Song, H.-J., Onishi, K. H., Baillargeon, R. & Fisher, C. 2008. Can an agent's false belief be corrected by an appropriate communication? Psychological reasoning in 18-month-old infants. *Cognition* 109 (3): 295-315.
- Southgate, V., Chevallier, C. & Csibra, G. 2010. Seventeen-month-olds appeal to false beliefs to interpret others' referential communication. *Developmental Science* 13 (6): 907-912.
- Southgate, V., Senju, A. & Csibra, G. 2007. Action anticipation through attribution of false belief by 2-year-olds. *Psychological Science* 18 (7): 587-592.
- Spaulding, S. 2010. Embodied cognition and mindreading. *Mind & Language* 25 (1): 119-140.
- Thompson, E. 2007. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Cambridge, MA: Harvard University Press.

- Thompson, E. and Varela, F. 2001. Radical embodiment: Neural dynamics and consciousness. *Trends in Cognitive Sciences* 5 (10): 418-25.
- Träuble, B., Marinović, V. & Pauen, S. 2010. Early theory of mind competencies: Do infants understand others' beliefs? *Infancy* 15 (4): 434-444.
- Trevarthen, C. B. 1979. Communication and cooperation in early infancy: A description of primary intersubjectivity. In M. Bullowa (Ed.), *Before Speech* (pp. 321-347). Cambridge, MA: Cambridge University Press.
- Trevarthen, C. and Hubley, P. 1978: Secondary intersubjectivity: Confidence, confiding and acts of meaning in the first year. In A. Lock (ed.), *Action, Gesture and Symbol: The Emergence of Language* (pp. 183-229). London: Academic Press.
- Varela, F., Thompson, E., and Rosch, E. 1991. *The Embodied Mind*. Cambridge, MA: MIT Press.
- Walker, A. S. 1982. Intermodal perception of expressive behaviors by human infants. *Journal of Experimental Child Psychology* 33: 514-535.
- Wheeler, M. 2005. *Reconstructing the Cognitive World: The Next Step*. Cambridge, MA: MIT Press.
- Wheeler, M. 2008. Mind, things and materiality. In Renfrew C. and Malafouris L. (eds.), *The Cognitive Life of Things: Recasting the Boundaries of the Mind*. Cambridge: McDonald Institute for Archaeological Research Publications.
- Woodward, A. L., and Sommerville, J. A. 2000. Twelve-month-old infants interpret action in context. *Psychological Science* 11: 73-77.