

Introduction

Pointing: A Gesture that Makes Us Special?

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Pointing is an exciting theme of scientific and philosophical inquiry. Even though this line of inquiry is built upon a very long scholarly tradition, our comprehension of the implications of pointing for our mental, social, and cultural lives is still at the very beginning. Discussing these implications means facing complex conceptual problems situated at the intersection of “language, culture, and cognition”, as suggested by the subtitle of Sotaro Kita’s influential readings (Kita 2003) - a book that our collective work is inspired by and deeply in debt to.

These problems appear especially tantalizing from a philosophical perspective. Because I am a philosopher, in this introduction I would like to mention some of the speculative challenges that involve pointing as a crucial theme of philosophical investigation, including a rapid sketch of the phenomenological background that originally inspired the idea of this special issue of *Humana.Mente*. This seems to me the most honest way to present and appreciate the work of the colleagues who decided to participate in this collective project with their specific disciplinary competences and their irreducibly diverse viewpoints (some of which might not be entirely reflected by the contents of this introduction).

The problems disclosed by pointing challenge common sense by revealing theoretical puzzles hidden within our most ordinary social practices, beyond the only seeming simplicity of everyday routine. Take as an example non-verbal deixis via indication, so familiar and customary but so unobvious in its epistemic and normative preconditions (this is one of the main issues addressed by Olivia Sultanesco & Kristin Andrews, in this journal issue, as well as by Richard Moore and others). These preconditions are part of the set of basic ingredients that scaffold the very possibility of a culturally transmissible,

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publicly verifiable, objective knowledge: joint attention, reference and declaration, conventionalized semiotic codes, “mind reading”, symbolic thought, and of course language. Joint attention is likely to be one of the most primitive of these ingredients, and it is the fulcrum of intense disputes on the origins of human sociality that largely intersect the debate on pointing (for a comprehensive and up-to-date exploration of these disputes, see Seemann 2011, another key interdisciplinary reading that deeply influenced our project. You will find it reviewed in this volume by James Dow).

In general, all of these faculties are - or have been deemed to be - linked to the embodied habit of sharing experience through pointing and the remarkable developments of social intelligence enabled or solicited by this sharing: for example, pointing is probably one of the precursors of the practice of intersubjective validation that we employ to check the parity of our shared beliefs and hence institute objective knowledge in a public domain. Of course, not all forms of pointing aim to verify the correctness of our semantic labels, and not all practices of verification aspire to public consensus, but one might wonder if the characteristic epistemic practices of the *Homo* species, involving truth and falsity, could have ever emerged in any species that did not systematically control social gaze and joint attention through pointing (clearly, science must be one of the descendants of these practices, and one of the most powerful. It is curious to remark that, in a sense, when we scientifically study the preconditions of pointing, we are also implicitly investigating the origins of the very science we are adopting for that task).

Investigating pointing doesn't only require exploring the stages of child development and the varieties of apes' communication (as most of the contributors of this special issue do), but also the grammar of sign language (see Richard Meier and Diane Lillo-Martin, in their contribution), as well as the impenetrable world of autistic subjects (see Laura Sparaci): irreducibly complex realities whose experiential and functional details are neither deducted by means of formal logic, nor extracted by naïve intuitions about our average everyday experience, nor exhausted by computational models and informational flowcharts. Faced with this complexity, isolated fields of knowledge show their limits, and the interdisciplinary cooperation between humanities and natural sciences proves a methodological necessity, apart from an exciting adventure: a mission in which philosophy - with its talent for bridging different languages and methodologies - plays a prominent role.

Humanamente provided a conducive intellectual environment to develop our interdisciplinary reflection on pointing: this young and enterprising journal has been able to promote an efficacious interdisciplinary forum, inviting philosophers and humanists to reformulate the oldest questions and explore the newest answers with the backing of empirical data and quantitative methods, and the stimulus offered by naturalistic studies. Sustained by the vigorous input of the authors, this special issue of the journal attempts to achieve this ideal integrating the achievements of behavioral experiments (as represented, for example, in this journal issue, by Andrew Olney and Richard Moore), conceptual and experiential analyses (Nick Young, Angelica Kaufmann, & Bence Nanay), brain imaging techniques (José Ulloa & Nathalie George), evolutionary accounts of cognitive functions (Nathalie Gontier), functional models of gestural activity (Massimiliano Cappuccio, Mingyuan Chu, & Sotaro Kita), etcetera. I think this attempt proved successful, if for no other reason that a surprisingly diverse panel of talented – and, in some case, already well established – researchers kindly accepted the invitation to join this collective project, betting on its farsightedness and theoretical ambition.

Seminal interdisciplinary research lives of such team-based explorations. In particular, the key issues disclosed by pointing lay along the frontiers of the very capability of shared representations and public knowledge, a territory that ranges beyond the jurisdiction of any single disciplinary field. Single scientific disciplines inhabit this territory and flourish on it, but can neither own it nor see its borders. Only a nomadic philosophical approach to science, i.e. an approach that is not at home in any of these disciplines but programmatically wanders through all of them, can help reach the extreme frontiers of this investigation. Indeed, the tools for a genealogical investigation on the capability for shared representation and public knowledge has often been prompted by theoretical approaches (like the phenomenologically and empirically informed philosophies of mind) that aim to trace the cognitive pre-conditions of intersubjectivity back into the biological and social history of our most ancient epistemic practices. In fact, whether the gesture of pointing springs from an innate predisposition or not¹ it is always through a network of acquired habits that its particular uses were shaped in local contexts: through an amazingly convoluted history in which natural propensities and socio-

¹ This seems very likely, if we consider that even blind infants spontaneously accompany their early speech production with this gesture, cfr. Bigelow (2003).

cultural conventions intertwined and redefined one another. Genealogical philosophy can provide only the drive and some of the words to tell this story, but not the whole story itself. Other disciplines will tell some parts or some versions of it: developmental psychology, comparative neurosciences, cognitive anthropology and archeology of mind, primatology and animal cognition, linguistics, semiotics, and analytic philosophy of mind...

In consideration of this plurality of narratives, integration of conceptual analysis, phenomenological description, and empirical investigation becomes not only useful, but indispensable, also from a strictly philosophical point of view. Integration is not an attempt to supplement or corroborate an old metaphysical agenda with extra-philosophical contents and new methods; integration is itself intrinsically philosophical and productive of a new intellectual awareness, in so far it involves deep excavations into the ground of the primitive notions assumed by our disciplines, including philosophy itself, and the recognition that these notions come from an obscure abyss of pre-comprehension. Not simply because the genealogy of our concepts is always rooted in a tremendously remote past and eventually leads to many fathers, some of whom might turn to be very different from us (and even pre-human), but also because the meaning of our epistemic practices is silently buried within our every day linguistic games, a medium that is transparent to those who participate in these games without examining them philosophically.

Why is pointing so important for a non-metaphysical rediscovery of our originally embodied, intimately social, and historically situated practices of knowledge? This gesture, the indexical gesture par excellence, is crucial for its transitional, liminal value: it represents a defining acquisition in the development of higher-order, typically human, intellectual capabilities (e.g., collective symbolic imagery) and, at the same time, it relies on quasi-automatic cognitive mechanisms for coordinating visual stimulation and motor execution that are relatively basic and very common across animals species (e.g., gaze following, see Shepherd 2010). This ambivalence is clearly shown by the fact that, while it is the prototypical bodily vehicle of joint attention, the appearance of pointing also predicts the emergence of advanced forms of social cognition, more disembodied and reflective in character, possibly linked to altruistic cooperation (Tomasello 2009), abstract categorization, and – indirectly – sophisticated social experiences, like mutual recognition (in a strong dialectical sense, *cf.* Ikaheimo 2010) and public validation. Pointing's key role in the acquisition of new forms of intelligence raises important issues about

both the advent of joint attention in phylogenesis and its role in the evolution of the earliest forms of referential, proto-cultural, and linguistic activity: for example, primatologists investigate whether the declarative function of pointing is human-specific or not (again see the contributions of Gontier, Moore, and Sultanescu & Andrews); developmental psychologists ask when the earliest instances of pointing come about, and if they imply some pre-linguistic form of mindreading (Sparaci); in cognitive semiotics, it is hotly debated whether pointing's evolution may have scaffolded non-natural codes of communication for symbolic referencing (Olney). Arising from the background of these ongoing debates, but hesitating to find a precise position in them, this special issue of *Humanamente* advances across three theoretical axes, representing the general questions that our collective work addresses.

1) What is the role played by pointing in the emergence of pre-linguistic, proto-declarative forms of communication? We are interested in how an agent's effector primarily serving direct interaction (hand grasping and reaching) can be exploited and reused as a normative model for a form of coordinated attention that seems detached and merely contemplative. One important issue is whether and how declarative and informative uses of pointing differ essentially from its imperative uses, and if different cognitive resources are recruited to control the former or the latter. This issue is analytically addressed by Moore's paper, which offers a series of accurate differentiations to better understand the functional and communicative specificity of declarative pointing. Moore assumes the Gricean theory of meaning (Grice 1957) in the framework of Michael Tomasello's studies on apes' understanding of declarative pointing, while remaining open also to different explanatory options. Leavens' perspective on this crucial issue is clearly stated in his generous foreword, which underlines once again that proto-declarative and proto-imperative forms of pointing share the same interactional and instrumental function (in this specific context, "instrumental" means "pro-active and manipulative"). This perspective is grounded into phylogenetic and comparative studies, but is importantly corroborated by a developmental perspective, especially if that developmental perspective encompasses atypical conditions: in this vein, Sparaci analyzes why lack of pointing is an important symptom for the diagnosis of autistic spectrum disorder in infancy, and concludes that the imperative/declarative distinction is less important than developmental trajectories and the role played by pointing in the typical acquisition of social cognition. Also Gontier offers a rich

investigation of this acquisition, but from the perspective of evolutionary epistemology: her paper investigates how pointing behaviour might have preceded and facilitated the origin of both gestural and vocal communication, and discusses which evolutionary mechanisms might be involved. If, on the one hand, explaining how natural gestures could evolve into grammaticized communication proves a challenging task, to understand how conventionalized systems of signs derive their logic from embodied, manipulative gestures is not less interesting: the paper by Meier and Lillo-Martin provides a comprehensive and very informative exploration of how the status of pointing, as a conventional element of signed languages, relates to pre-linguistic deictic practices.

2) How does pointing reorganize our spatial perceptual experience to allow public representation of distal, absent, or abstract entities? According to theories like “motor intentionality” (Merleau-Ponty 1945) and “two visual pathways” (Milner & Goodale 2006), pointing prototypically discloses a “spatiality of position” (metric coordinates), as opposite to a “spatiality of situation” (opportunities for action). It is interesting to see what role is actively played by finger pointing in accomplishing this transformation, if this gesture has the power to modify the spatial experiences of the pointer and the other co-attenders. The geometry of space perception, considered in its relation with the domain of intentionality and social experience, is the topic of Ulloa’s & George’s paper, which offers a review of the brain mechanisms underpinning the understanding of pointing, and focuses on the geometry of eye gaze coordination and the associated joint attention processes. Baccarini’s review offers a helpful introduction to the neuroscientific data supporting the “two visual pathways” theory, and explores some of the possible links with pointing and gaze coordination. This account is also mentioned and briefly discussed in Cappuccio, Chu, & Kita, where motor and cognitive intentionality are contrasted to describe the specificity of instrumental gestures (as distinguished from goal-oriented actions), and pointing is characterized as capable to actively modify the practical valence of spatial experience through instrumental representation of gaze direction in a spatiality of position (note that, in this context, a gesture is “instrumental” if it is meant to enhance certain cognitive performances).

3) Pointing is not just a flexible universal designator capable to highlight conventional and arbitrary meanings, it is first of all a bodily gesture, a motor action that has been exapted for communicative purposes in a concrete context

of unprincipled bodily engagement. How do embodied and culturally acquired elements of social cognition coexist in pointing's unique symbolic function? To discuss this issue, Young, Kaufmann, & Nanay develop a detailed discussion of different hypotheses concerning the representational status of the cognitive processes recruited to produce and understand pointing. Also, Sultanescu & Andrews offer an important consideration about the representational status of pointing, in that they face the problematic definition of referentiality, discussing this notion in the light of the idea that intentionality intrinsically is "aboutness", and that different varieties of intentionality might be available to non-human primates. Apes are of course relevant in every discussion about the origins of pointing because of their evolutionary and morphological proximity with human beings; but domesticated species are not less interesting because, through interspecific coordinated behaviors and joint activities, they remind us how much of our cognitive endowment we share with them, especially those activities that require sharing symbolic codes of communication: this is the topic of Andrew Olney's contribution, which interprets the question about dogs' responsiveness to pointing in the light of Peircean semiotic categories. And again, the paper by Cappuccio, Chu, & Kita discusses the representational status of pointing, proposing a simulationist hypothesis that doesn't imply meta-representations of mental states: as an "instrumental gesture" (in the sense of "cognition-boosting"), pointing provides an externalized symbolic model of a goal-directed action, which in this case is the act of eye redirection and gaze following.

These three questions ask to identify the boundaries that define three different conceptual couples: contemplative vs manipulative, positional vs situational, and cultural-symbolic vs embodied-embedded. I believe that, when examined at the level of the underlying cognitive architecture, the sense of all these oppositions is by and large reducible to the representational/dispositional distinction, i.e. the distinction between contentful and directed forms of experience. If this intuition is correct, then the research on pointing deserves an even more careful attention, especially today that the cognitive sciences are called to engage in a deep reflection on their own definition: during the last two decades, various theoretical options have been competing to replace the old cognitivist paradigm based on centralized instructions, internal representations, and computation of informational contents. These days, all the liveliest trends in philosophy of

cognitive science de-emphasize the role of representations (i.e. stored heuristics, internal models, and explicit rules) in explaining basic (i.e. embodied-embedded) forms of organismic intelligence (e.g., Gallagher 2005, Noë 2009, Varela et al. 1991, Wheeler 2005, etc.). In the attempt to definitively replace the paradigm of classical cognitivism, both enactive (Varela et al. 1991, di Paolo 2005, Thompson 2007) and extended (Clark & Chalmers 1998, Rowlands 2010, Menary 2012) accounts of cognition have been evoked to explain intelligence without postulating representational/symbolic mechanisms, though these two types of account didn't always reach the same theoretical conclusions. According to the most radical views (Hutto & Myin 2012), the very attribution of representational contents to basic mental activities amounts to a categorical mistake, because the relevant meanings of our experience are directly presented through direct engagement with the circumstances, without needing internal re-presentation.

That basic minds don't need representation to produce intelligent behaviors means that they are coupled with their specific environments in such a way that they can skillfully find their way in the world, immediately sensing the relevant contextual opportunities for action and flexibly adapting to them, modulating their conduct to keep a dynamical balance with rapidly changing, massively interconnected networks of actual or likely conditions. This view is supported, from the point of view of the logico-functional architecture, by the observation that no set of representations or pre-defined heuristics could possibly be sufficient to instruct the flexibly adaptive and rich behavior that is spontaneously produced by the simplest form of life. From a phenomenological point of view, we recognize that most of our skilled behaviors, including joint activities, are not necessarily mediated by propositional or conceptual contents. On the contrary, they are driven by the ongoing unprincipled negotiation between the embodied-situated cognitive system and its raw environment, through complex feedback loops traced by a continuous series of acts of perception and movement whose function is explorative and compensative at once.

In this debate, the symbolic function of pointing presents a dilemma for any attempt to reduce all forms of embodied-embedded cognition to merely enactive, adaptive, dynamic, non-representational and non-symbolic systems (Cappuccio & Wheeler 2009). In fact, as the fascinating studies by Michael

Tomasello and his collaborators pointed out, the most extraordinary communicative power of pointing, the feature that gives this gesture a special position among natural deictic signals, is probably that it doesn't merely highlight affordances to solicit the co-attenders' engagement in joint activities (as described by Hutto 2011); additionally, pointing can suppress the saliency of those affordances, transforming the objects of joint attention and socially aware perception into foci of extemporaneous reflection, to reveal the common ground of implied information that is shared by the co-attenders, hence emphasizing their implicit norms and conventions, evoking past memories, and soliciting inferences about future, distant, or merely imaginable situations (Tomasello 2008). By relying on our systematic and multifaceted inclination to imagination (a legacy of our long history as creative tool makers and organized foragers), the declarative/informative function of pointing goes well beyond the capability of this gesture to immediately prompt and coordinate interactive goal-oriented behaviors.

Of course, the supporters of enaction theory, interaction theory, and participatory sense-making (De Jaegher & di Paolo 2007; Gallagher & Hutto 2008; De Jaegher, di Paolo, & Gallagher 2010) might object that every time we are having dinner, and you point to the salt, this gesture immediately solicits my reaction of passing the salt. I immediately map the meaning of your gesture in terms of the most appropriate behavioral response of mine: so, I am immediately affected by your pointing as a kind of request. This objection makes certainly sense in this scenario because producing and understanding pointing typically amounts to adapting our conduct to the implicit social norms embedded in the immediate context of our embodied, interactive, unproblematic engagement, without any need for explicit imagination, reflection, or detached symbolization. But, I believe that, if this objection is substantially correct, it is correct only to the extent that the agents of our example are educated by their cultural practices to sit together at a table for dinner, use salt to make foods tastier, request and pass containers, etc. Individuals who don't usually make sense of this set of practices in the same way we do it (for example because they don't belong to a culinary context in which people systematically use salt as a taste enhancer) might find that the content of this request through pointing is not evident, and could actually fail to understand that that is a request *at all*: without sufficient cultural or attitudinal preparation, I might legitimately have to guess whether your index finger is meant to indicate some properties of salt (color, mass etc.), or the salt

itself (and... what is salt by itself, abstracted from its properties?), or its container, or the point in space that is occupied by them; the under-specification of the referent might make me wonder whether your pointing is meant to convey a request (“give me that!”), or a question (“what is that?”), or an attempt to highlight some particular declarative contents associated to the scene (“look at that...”), i.e. a indefinite number of notions based on the background information that is supposed to be shared by both me and you, as a part of our common knowledge and the history of our previous interactions (knowledge encompassing commonsense notions such as: “salt is unhealthy”, “salt can spoil the taste of your soup”, “the salt shaker is almost empty”, “you should buy extra salt”, “you should use only sodium-free salt for your blood pressure”, etc...). Note that, while some of these notions might be directly available to an embodied agent as behavioral dispositions, i.e. in terms of non-representational know-how, one might suppose that at least some of them must be mapped in terms of explicit know-that, i.e. a kind of detached knowledge that is possessed as a content mapped in propositional format, or is not possessed at all.

The salt example shows that a familiar context of direct interaction can immediately provide each co-attender with a safe and reliable set of expectations and action-specific roles, so that there is no mindreading or inferential procedure required. But, at the same time, the familiarity of this example shows also that there is nothing “normal” in it, no predefined, supposedly natural context of interaction, i.e. no situation intrinsically endowed with objective meanings that pointing would only need to “reveal”, as it were. This revealing means always also creating, this sharing is always also re-constructing and co-instituting. No scenario of intersubjective engagement, regardless of how apparently simple and immediate, is in principle safe from the risk of misinterpretation and non-sense, especially if those who engage in communication are not acquainted with some minimal background of social and cultural norms. Therefore, pointing can solicit actions that are already expected in familiar contexts, but the actions that it can solicit are always countless, like the symbolic meanings potentially associated to the object targeted by pointing. Inaction, or the suppression of actual physical action, is one of these action possibilities: In unfamiliar, non-scripted scenarios this multitude of possibilities tends to prompt active reflection and imaginative efforts, requesting the agents to momentarily step back from their direct

engagement and ask themselves how to make sense of it from a partially detached (but still practically oriented) perspective.

If this conclusion is valid, then it is easier to appreciate the full depth of the dilemma that troubles the contemporary attempts to redefine basic cognition without involving any sort of representations:

- *either* we exclude representational and contentful elements of social intelligence from our model of pointing, using only enactive and interactionist accounts of intersubjectivity based on direct perception (but in such a case it becomes impossible to fully model the early, primitive, spontaneous symbolic function of pointing, and its crucial importance for the emergence of collective imagery and public cultural contents);

- *or* we rely on mentalistic and meta-representational accounts of social cognition based on contemplation and detached inference, overlooking that pointing is an embodied-embedded motor act, a social affordance largely controlled by automatic dispositions through direct perception (but in such a case it becomes impossible to understand the most direct social function of pointing, i.e. its power to prompt and coordinate joint activities through immediate responses to gaze cues).

While accepting either option seems necessary at a first glance, both options seem problematic, if not unacceptable. First of all because the capabilities of producing and understanding pointing, in their minimal preconditions, always presuppose not just one of these options, but some combination of them, even if they seem mutually exclusive. What is presupposed by pointing is exactly the operating distinction, experienced as an irremediable gap, between a merely embodied/embedded/interactive form of social cognition and a symbolic/representational/detached one: without this distinction we would not be able to account for the “contentfulness” of pointing, determined by the non-natural function of declarative communication; we would not be able to distinguish a well formed and intentionally indicative instance of pointing from an unintentional failed attempt to grasp; we would not be able to distinguish pointing as a request from pointing as a way to share information; and we could not make sense of the conceptual separation between the pointing gesture, the object indicated by pointing, and the symbolic meaning associated to them in a particular context by a specific group of co-attenders. The specific goal of pointing, its Gricean communicative intention, would be lost. Therefore, one might

legitimately ask: how is pointing situated with respect to our core distinction? Does pointing involve embodied, enactive skills (like grasping or routinary tool use, which do not imply explicit thinking or rule-following procedures), or representational, symbolic ones (like evaluating and comparing detached bits of information, when the content of thinking is explicit and based on intellectual rules and procedures)? I would like to briefly point out that this question, reformulated here in accord with the notions assumed in today's dominant debate on the foundation of cognitive science, was not unknown to neuroscientists, phenomenologists, and philosophers of mind of the past.

The core distinction that I presented here is not just a theoretical outcome of the contemporary research on action and spatial perception: it is actually situated at the source of that research – at least since when Goldstein and Gelb (1918) documented that their patient Schneider was not capable to indicate his own nose, when requested to do so, but could easily locate it in his face when he needed to blow it. As stressed by Dreyfus (2002) and Kelly (2002), Merleau-Ponty's *Phenomenology of perception* (1945) is deeply inspired by Schneider's pathology, and gives a great importance to the fact that encountering the objects of our everyday activities with a practical scope in mind, or pointing to them to highlight their objective positions in space, correspond to two different modalities of intentionality ("cognitive" and "motor" intentionality, respectively). In recent years, this view has been re-actualized and updated by Milner and Goodale (1995), especially through the case study of patient D.F.. Pointing, which originally arises from the background of perceptual and attentional competences of situated agents directly involved in practical contexts, is also intrinsically connected with our capabilities to create and read conventional symbols, manipulate arbitrary contents, and process the associated information as context-independent. To some extent, pointing must play a role in enhancing and guiding these capabilities, in evolution and development: after all, pointing is a universal symbolic designator, the first and most essential bodily act uniquely designed for sharing representational contents through the conjoined interpersonal manipulation of direct perception, imagination, and inferences.

Their theories suggest interesting implications for answering the aforementioned question, and in general for the very foundation of the sciences of mind. I would like to suggest that, if our core *distinction* is fundamentally correct, phenomenology helps us to realize that it doesn't necessarily amount to an *a priori* dualistic *opposition*, because recognizing the

embodied nature of pointing doesn't necessarily imply the rejection of its representational function, if we correctly understand this function as an externalized, concrete symbolic manipulation of a perceptual model of action (or inaction) that aims to active coordination. If we accept that these two options are not mutually exclusive, then the core distinction does not imply a dilemma anymore. This approach to the ambiguous nature of pointing becomes even more remarkable, and certainly more productive, if we understand the implications of the phenomenology of embodied intelligence for the current debate on the theoretical foundation of the cognitive sciences. This is after all the question about the definition of "cognition" and "intelligence" that animates this special issue of *Humanamente*. This question inspired a series of research papers co-authored by Michael Wheeler and me (Cappuccio and Wheeler 2010, 2011, 2012), dealing with the foundation of cognitive science in the light of Martin Heidegger's thought.

In one of them, Cappuccio and Wheeler (2011), the cognitive background of pointing is deepened in a Heideggerian perspective. This reflection inspired the original motivation to edit this special issue of *Humanamente*, and I find it useful to mention it here, as Heidegger's paper "What Calls for Thinking?" (1951-52) is the main source of the phenomenological ideas that I am going to introduce in what follows. Indeed, phenomenology is one of the philosophical methods that provide the most powerful stimuli to re-think cognition without contents, in line with the radically enactive view, especially when one addresses the constitutive function of intersubjective embodied experience. In general, the landmarks of the phenomenological tradition have been incessantly evoked by the theorists of the embodied-embedded approach (Varela et al. 1991). And Heidegger, who definitively deserves some reflections in this context, is one of the most referenced and inspirational philosophers of this tradition (see the fundamental work by Kiverstein and Wheeler 2012). The existential analysis inaugurated by *Being and Time* (Heidegger 1927) stresses that our way of inhabiting the world (an experience that encompasses both intervention and understanding) is first of all a practical and engaged relationship, as opposed to a detached and intellectual stance. This view implies that the agent's possibilities of action and her world-environment's possibilities of meaning continuously co-vary, and moreover they mold and reshape one another's boundaries, without the mediation of rules, stored scripts, or internal models. But, if phenomenology helps us think the embodied non-representational foundation of intelligence, it allows us understanding the emergence of

representational, symbolic forms of intelligence too, without dualisms and exclusive oppositions. What happens when our immediate relationship with our implicit background of coping breaks down, and rules of interpretation (explicit guidelines, like snap maps or heuristic principles) become necessary to reconstruct the relationship with the world-environment in uncanny, uncertain situations that invite meditation and careful decision? For example in front of a *sign* we can hardly make sense of, like an unfamiliar gesture, an indicative act whose communicative intention is inexplicit and not immediately available in perception (Heidegger 1927, pp. 111-112; Cappuccio & Wheeler 2010). Interestingly, Heidegger refers to the issue of the uncanny precisely when he addresses pointing as a philosophical issue, characterizing the human being as a creature destined to point.

According to his view, there is no such unrelated, disengaged, precondition-free standpoint, no aseptic view from nowhere that would allow us to judge things from a neutral perspective (e.g., to recognize the “objective” meaning of the polite request of passing the salt), because this would mean being able to escape the structural condition of hermeneutic circularity in which we are always already situated. Because the relationship with the world-environment is always one of pre-comprehension, interaction, and direct engagement, we must consider that any local interruption of the interaction is, after all, just one of the possible modifications available in the ecology of some broader context of engagement, with its expectations, goals, etc. In fact, the reasons of a lack of relationship with the others, like an insurmountable physical distance, a semantic mismatch, an intervening incommunicability between agents, can and occasional do play a role in the coordination of social behaviors, disclosing new scenarios for mutual, detached, and reflective comprehension. There are contingencies in which interaction stops working *as such*, i.e. as a significant recognizable condition of engagement, and such contingencies can have a peculiar function, as they have the power to prompt a new awareness that nullifies the affect for direct involvement, and solicits us to secure an appropriate time for problem solving, conceptualization, and detached contemplation. Pointing is perfect to illustrate how this power operates.

It seems that pointing is just another embodied act, morphologically not too dissimilar from the goal-oriented motor actions that trace the virtual boundaries of the peripersonal space through the extension of arm/hand/fingers, such as reaching and grasping. Its true that its referential

meaning strongly depends on an interactive context and, among other things, on the sensorimotor predispositions of signaler and recipient (gaze following): therefore, it is mediated by the possibilities of sense-making disclosed by the intercorporeal relation among participants who align their direction of attention. But the referential scope of pointing is not all we need to bring about its meaning. On the contrary, its possibilities of signification are based on establishing a distance between agents, on transcending the immediacy of their corporeal details for the sake of conventional communication, on putting into brackets the concrete circumstances of their interaction in order to highlight another set of possible, symbolic, abstract meanings, in a virtual scenario. That is why the proper meaning of declarative/informative pointing doesn't lay in the physical transformative effects that it might achieve through requests or commands, but in the epistemic effects that it produces by manipulating the social background. Pointing is not just a morphological variant of the most primitive acts of manual manipulation, like reaching and grasping, but an exaptation of them in a real of virtual possibilities. Some authors, beginning with Vygotsky (1962), advanced the hypothesis that pointing emerges as a failed attempt of reaching and grasping, a failed attempt that - in the context of troubled or constrained interaction (as through the bars of a cage, across the distance of an out-of-reach desired object) - spontaneously evolves into a ritualized representation of those very actions of reaching and grasping, hence acquiring the valence of a request (bring or carry), i.e. an automatic solicitation to complete a task that is impossible for the pointer. A recent study (Carpendale and Carpendale 2010) gives credit to Vygotsky's idea, showing that early instances of full-hand pointing have the main function to monitor the child's own direction of attention; they subsequently acquire a social and communicative meaning when the child realizes that this gesture modifies the gaze direction of the caregivers and solicits their appropriate responses in accord to the infant's desires. In typical circumstances, this means that pointing can produce joint attention first of all because it efficaciously reflects the infant's clear intention to reach and grasp.

If pointing is *in principle* prevented from manipulating physical objects, because it is only meant to explicitly signal a failed attempt to reach and grasp, then that there can be no *actual* physical object meant to afford pointing as such: only virtual, imaginary, symbolic objects can do it. Remember what the preconditions of an affordance are: according to Gibson's ecological theory of perception (1977), our actions are continuously afforded by the physical

objects in the environment that – for their morphology, position, and typical use - appropriately correspond to those actions, allowing them (like the shape of a ring solicits the act of precision grasp with thumb and index finger). But pointing is not a manual action in a typical sense, therefore there is no object specifically corresponding to it, at least no *actual* object. And that is why pointing has the power to indicate anything, in a virtual space of possibilities of representation, while nothing actual, in the extrapersonal world of the pointer, specifically solicits pointing. According to this perspective, it is exactly this suspension of direct, familiar opportunities of directly transformative action that allows pointing to disclose an entirely new set of possibilities of interactions (request, order, cooperation) that are based on the virtual neutralization of immediate physical manipulation, including those modalities of delayed or mediated forms of interaction that involve the presence of new semantic elements that are symbolic and representational in nature (because based on the visualization of an absent or abstract action). The availability of these new elements can “rewire” or deeply reconfigure all the previous possibilities of interaction available to the subjects, through the mediation of virtual models that were not perceivable or required before (Cappuccio and Wheeler 2011).

Supporting this phenomenological account, there is empirical evidence that pointing doesn't only orient and coordinate gaze, but solicits the reorientation of imagination too (Kendon 2004); and that is why it doesn't always convey a request or a command, as it can well have a merely informative, declarative function, suggesting symbolic contents through imagination. But what do information and declaration exactly work for, if not for interaction in the actual physical environment? How are these communicative intentions actually possible, and how did they arise for the first time? It is sometimes hard to disentangle practical-manipulative and purely communicative intentions: it is impossible to forget that even the early proto-declarative gestures in infants are essentially interactive and transformational in nature (Bates et al. 1975); and we should not overlook that these gestures are produced with an expectation of explicit recognition from the adults (Liszkowski et al. 2004). But what is key here is that, also when information or declaration are instrumental to initialize interaction, this scope can be mutually appreciated and shared just because the co-attenders are implicitly asked to temporarily withdraw from their context of mutual engagement, to pay attention to the mere fact that attention is being requested and that some information is meant

to be shared, regardless of what its immediate practical valence or communicative effect is going to be... The sense of virtuality implicit in this “regardless” is indispensable to appreciate the real practical valence and the communicative intention conveyed by any instance of declarative pointing, and to recognize that – in order to do something useful with pointing – it is necessary to assume (or *pretend*) that its intention is not to be immediately useful to the pointer himself, but merely informative and assertive. Effective interpretation of declarative pointing, and of its communicative intention, can occur because this gesture, intentionally shaped to vaguely resemble a goal-oriented manipulative action, is actually produced to reach a second goal that is patently different from direct physical manipulation, i.e. a non-goal that secures detached attention through temporary disengagement.

How could pointing possibly target this non-goal if it is, after all, the replay of another goal-oriented action? This is better clarified by the phenomenology of pointing, and in particular by Heidegger’s phenomenology which – I believe – deeply resonates with both Tomasello’s recognition of the special cognitive status of pointing and Leavens’ anti-dualistic interpretation of its function. Heidegger rejects dualism too, as he never claims that attention and engagement (awareness and action), exclude one another (though this thesis enjoyed some fortune among some of Heidegger’s English-Saxon interpreters – mainly Dreyfus). Heidegger assumes that interaction always requires some attention, and attention itself is to some extent a form of interaction – though it is one that serves a very peculiar interactive goal, ideally different from any other type of relationship. The relationship initiated by pointing is exclusive, but not unique, in the sense that it is based on the possibility (and expectation) of the virtual termination of all the other relationships, and on the mutual understanding of this possibility. It produces a new way of reciprocal understanding by negatively constraining and hence transfiguring the other ways of understanding, not by introducing a supplementary and intrinsically “higher” or more sophisticated mode of understanding. It conveys an exclusive request to move attention away from the practical circumstances of actual engagement to the fact that attention itself is – contingently – the most important practical circumstance for further engagements: this way, the focus of the co-attenders’ joint attention encompasses the reasons of their occurrent relationship of joint attention, and prompts attention to the very set of circumstances that motivate coordination of attention, soliciting awareness of

the reflective context in which joint attention is supposed to occur (Peacocke 2005, Cappuccio & Shepherd 2012).

In this anti-dualistic spirit, Heidegger's analysis offers an occasion to update the embodied-embedded account - without betraying its key message, but actually developing it in an unexplored direction. This doesn't mean to undermine the general framework of interactionism and enactivism (the meaning of our social practices still depends on the practical, relational, ultimately bodily context in which engagement occurs); on the contrary, this means making this framework more flexible, to further articulate its internal distinctions and allow extra degrees of freedom, specifying the negative/privative conditions that allow peculiar forms of "disengaged interaction", which - in spite of the almost oxymoronic form of this definition - occur every day in many concrete scenarios of our social experience. Being able to specify these conditions means being able to make explicit the borders of embodied-embedded cognition, clarifying when and why our ancestors' basic minds "without contents" have been eventually able to evolve beyond direct physical affordances, above their merely dispositional roots and produce a new form of social intelligence, eventually crossing the Rubicon of symbolic abstraction.

In this perspective, Heidegger (1951-52, pp. 382), who is still somehow sensitive to the humanistic narrative of the special status of the hand and its superior destiny, reminds us that pointing is not just an accidental feature of human intelligence, but a constitutive and absolutely unique vehicle of thinking. His key message, which revitalizes and radicalizes intuitions previously brought forward by German idealists like Johann G. Fichte and Georg W. F. Hegel, and resonates with other pragmatists of every time and place, such as Gianbattista Vico and Charles Sanders Peirce, is that manual activities, in general, are *constitutive of intelligence*, and not merely derivative or expressive of it, because they actively facilitate certain cognitive processes and allow the creation of new meanings. This is in substantial accord with the studies on cognitive performance enhancement via instrumental gestures (e.g., McNeill 1994; Butcher & Goldin-Meadow 2003; Chu & Kita 2008, 2011); it also resonates with the "extended mind" account of gestures as minimally representational mechanisms meant to monitor and self-stimulate thought (Clark 2013; Wheeler 2013; Cappuccio & Wheeler 2011), and with the pragmatism of many others embodied-embedded approaches to cognition. The most important testimony of this vigorous "manualist" trend is offered by

Zdravko Radman's inspirational reading, whose significant title is "The hand, an organ of the mind. What the manual tells the mental" (Radman 2013).

According to Heidegger, if manual activities deploy specific forms of thinking, this is true of the manual activity that we call pointing too: pointing make us think in the way we actually think, regardless of whether pointing via index finger is universally spread across cultures, and whether certain apes can occasionally point declaratively or not. We don't need to pay too much attention to Heidegger's claim that only humans have hands: whether non-human animals have hands for pointing or not remains an empirical controversy that biology will solve, not philosophy. Therefore, what really matters from the perspective of Heidegger's phenomenology, is not that the human condition is a requirement to produce or understand pointing, but that pointing plays a defining role for the human condition as such and, in a speculative sense, is *quintessential* of that condition: a condition characterized by the insuppressible inclination to tend towards what is distant, explore the unreachable, imagine the non-actual, the absent, the abstract. Ernst Cassirer (who, in 1929, entertained with Heidegger a famous, very animated, but deeply respectful and mutually influential exchange on this regard, see Gordon 2004) would have called this domain "the symbolic". Pointing is not just a particular way of occasionally expressing some pre-existing inclination towards the symbolic, it is an essential and prototypical drive for such inclination, its defining element and its motivating factor, the medium that humans employ to become the intelligent beings that they actually have a chance to be. This is Heidegger's core claim, one that can't – in itself – exclude that other animals could point, exactly because, from the point of view of the constitution of intelligence through manual activities, the access to the symbolic domain (with the disclosure of public meanings), is not a necessary precondition but *a possible outcome* of the use of declarative gestures.

The ancient onto-theological and justificatory narrative that sees the human as the only being capable of contemplation doesn't exert any influence in the framework of this relational phenomenology, a framework in which the concept of contemplation itself must undergo a profound revision to account for its concretely manual and practical origins. Remember that, according to Heidegger, pointing doesn't draw attention to prevent or obliterate interaction (this conclusion would be at odds with the pragmatist principles of the German author's existential analyses); in communication, pointing doesn't simply draw the co-attenders attention, it actually draws attention towards the fact that

attention has to be drawn. To promote this self-reflective movement of collective awareness is exactly the particular kind of interaction that pointing solicits in our experiences.

In Heidegger's words (1951-52), by pointing man "draws towards what withdraws", where the sense of the withdrawal is precisely an internal turn, or a possible outcome of the very act of drawing towards and its implicit possibility to fail. In fact, what withdraws from us is the structurally unreachable, the ungraspable correlate of a frustrated (or inhibited) attempt of interaction, one that implicitly defines its content as the object of an impossible experience, a structurally absent, unconquerable meaning. A meaning that, precisely because inhibited, becomes patent and overtly significant for public consideration as an open question that waits to be answered through further interactions. What withdraws is not fundamentally a linguistic meaning, though it is always possible that different instances of withdrawal could be associated with different linguistic meanings. Linguistic meaning is neither an intentional nor a real correlate simply denoted or presupposed by pointing: this judgment would erroneously assume that the essential and primitive function of pointing is denotation via reference, and that the meanings denoted by pointing exist as objective entities before getting highlighted by pointing. But this is clearly not the case, because denotation is just one of the possible relationships that can be established via pointing; and, in general, experience is not revealed as a publicly available content of representation (symbolic, propositional, conceptual etc.) unless a declarative gesture like pointing intervenes to disclose its presence in a joint attentional frame. The root of pointing's very possibility of signification in this frame is still its incarnated presence, the haughty power of a humble index finger to disclose new possibilities of meaning for sharing perceptual attention and interaction.

The act of withdrawal doesn't presuppose propositional contents or representations of another kind, because this would confuse causes and effects in the process of attribution of symbolic content. On the contrary, the withdrawal itself contributes to create those contents, in a public dimension, because it discloses the possibility of signification through the residuals of a failed engagement, the remaining of an impossible relationship of direct interaction: man draws towards what withdraws, via pointing, essentially because he is *drawing towards the withdrawal itself*. In other words, what he draws towards is the very act of establishing a distance, of interrupting an interaction. This is Heidegger's most interesting intuition, and probably also

the most difficult to accept for those who believe in the *a priori* cognitive preconditions of pointing (whether representational or enactive in nature): the establishing of a distance, of a delayed or transfigured interaction, is not a real condition of the physical or psychological world, an objective requirement presupposed by the activity of pointing; on the contrary, it is an expected or desired effect of its intervention, an act of disengagement which mainly serves *to highlight the possibility of the engagement itself* (and of its termination), radically reconfiguring the horizon of our relevant experience, and of our involvement in it. When we withdraw we interrupt or delay interaction, and we do so exactly to show that a withdrawal was possible, and that the interruption of interaction was desired. By drawing towards the withdrawal, via pointing, we assert that we can jointly coordinate our interaction in the form of virtual non-interaction, i.e. waiting and attending together. And, by asserting it, we happen to represent it to ourselves, instrumentally. This is plausibly how a community of pointers - were it formed by our ape-like ancestors, or small infants gesticulating in their cradles to initiate playful communication with their parents - can conquer attention as a useful vehicle of interaction in spite of (or thanks to) the interruption of interaction.

This phenomenology accounts for the fact that pointing solicits the coordination of imagination, and not only perception, in the distance disclosed by neutral observation: this gesture reaches a logical space that extends beyond our possibilities of direct physical manipulation, disclosing the unreachable realm of contemplative experience. Contemplation – it should be clear at this point - is not an alternate modality of experience, opposed to interaction, but one that completes interaction through the residuals, the useless traces of abandoned interactions. Contemplation predicts specific postures, attitudes, and a certain readiness to dealing with virtual circumstances whose possibility is only disclosed through an actual impossibility. But it is a peculiar form of readiness, one that asks to neutralize all the other forms of readiness (e.g., readiness to reach, to grasp, to manipulate), in order to reflect on the situation from a distance, and allow detached decisions on it.

As David Leavens authoritatively warned us in his foreword to this volume, as well as in many other occasions of scientific debate (e.g., Leavens 2004, Leavens and Racine 2009, Leavens 2012), we should avoid dualistic interpretations of the specific function of pointing, i.e. as a vehicle of pure attention (attention for the sake of attention), as opposed to one of practical

interaction. I think the reason is that this dualistic opposition is still part of an anthropocentric discourse that implicitly assumes a radical discontinuity between the humans, destined to speculation, and the animals, incapable of establishing a reflective distance. I personally embrace the philosophical sense of this warning because I think that the intellectualism implicit in this dualistic discourse risks preventing or distorting the necessary radical transformation that a correct phenomenology of pointing must achieve in today's effort of reconstructing the cognitive sciences.

I think that Leavens wants us to be suspicious about such anthropocentric views: by assuming that pointing requires unique dedicated cognitive mechanisms to be produced and understood (such as higher-order mindreading, explicit mentalistic attribution of intentional states, etc. See Harris 1996 and Tomasello et al. 2005), and that these preconditions are human-specific, certain mainstream approaches in primatology intend pointing as a behavioral marker and a testimony of the special status of human intelligence. Combining this theoretical assumption with the data collected through a series of comparative studies aimed at showing that only humans, not apes, point declaratively (e.g., Liszkowski et al. 2004, 2006, 2007, 2009), these approaches promoted a clear statement about the special status of the human condition (Povinelli et al. 2002, Carpenter & Call 2013, Tomasello 2006), hence implicating the isolation of the humans in the particular social and symbolic world that apparently no other species can access. Leavens, who is one of the most authoritative and resolute promoters of another way of interpreting the social cognition of apes, reminds us through his prominent academic activity that we must use very different methodological and psychological categories if we want to attribute a fair status to the social intelligence of non-human primates. First of all, because we recognize that the social worlds of apes and humans are not hermetically isolated, but offer important elements of overlap and continuity, also through the practices of joint attention and symbolic intelligence that are available to both of them. These practices employ, importantly, pointing – which, according to Leavens and his colleagues (e.g., Leavens & Racine 2009; Leavens, Bard, & Hopkins 1996), as well as some recent researches (Meunier et al 2013), is not unknown by chimpanzees, bonobos, and orangutans, even in the wild, though its use among these species admittedly is way less frequent than among humans.

I would like to interpret Leavens' anti-anthropocentric and anti-dualistic caveat in the light of a phenomenology of intersubjectivity that doesn't stress

the special status of humans among animals, but rather the special status of pointing among the natural signs that are, in principle, usable for ostension and reference by both human and non-human animals (see Cappuccio and Shepherd 2012 for a full analysis). This phenomenology suggests that it is not unreasonable to introduce a radical discontinuity, if this discontinuity operates between different types of intelligent practices, not between the innate cognitive architectures of humans and apes. Indeed, what many theorists seem to overlook is exactly that, if the social experience associated with pointing has a special function, this function derives from the exercise of pointing itself and to its peculiar phenomenology as an embodied vehicle of interaction, not from the a priori mental constitution of the species that uses it. In other words, it is not that humans point because the human condition is special (in fact, even if that condition were actually special, nothing could tell us in what this special status consisted, unless we look at how our concrete practices happen to shape and structure our everyday processes of thought); on the contrary, one should say that the human condition – at a certain point of an extremely long and complex process of co-evolution of brain and symbolic practices – has eventually got a chance to become somehow special (if this is actually the case) because humans happened to start pointing.

It was precisely pointing that offered to the human species access to a particularly advantageous dimension of social interactions, whose benefits in terms of fitness were capable to exert selective pressures in the direction of a co-evolution of genetic traits and cultural habits associated to gestural expressivity. Thus this transformation was achieved by pointing itself as an exaptation of previous forms of embodied interactions, not by innate cognitive mechanisms that seem adapted just to justify the presence of pointing, but that would be in themselves unjustifiable in absence of pointing. Do you start getting worried, at this point, by some chicken-and-egg evolutionary puzzle? I don't aspire to placate these worries, but I think that one should complement them with the awareness that we still lack a satisfactory adaptationist explanation of why natural evolution should ever provide a species with a *specialized* innate cognitive module for recursive mindreading if its members don't even master the practice of declarative pointing yet, considering that that is one of the most prototypical and fundamental practices (if any) for which that specialized module could possibly turn useful.

Joint representation of shared intentional states and informative contents cannot be presupposed by pointing, actually they must have been actively

scaffolded in their evolution by the peculiar perceptual and attentional practices incarnated by the bodily reality of pointing. The same principle, if correct, must apply to the apes who point, in so far as they actually point in declarative/informative contexts: whether they access the same dimension of joint attention and symbolic cognition that is typically accessed by human is broadly a matter of a quantitative - not qualitative - difference between humans' and apes' cognitive architectures. It is an *a posteriori* function of the levels of frequency and reliance reached by apes in governing this gesture as a part of their repertoire of preferred behaviors, not an a priori condition of presence/absence of innate task-specific cognitive modules.

In the light of these considerations, it seems to me that Raymond Tallis' thought-provoking essay (2011) offers a fundamentally correct intuition: there is something special and unique in the pointing gesture, something that – like Michelangelo's index finger in *The Creation of Adam* - suggests a transcendent upswing. But exploring how transcendence has been concretely produced by pointing, i.e. understanding the concrete operations that made that upswing historically possible, seems way more important than abstractly stating the supposedly higher status of pointing in its transcendence. Because that status can only reflect the situated specificity of a certain practice in its everyday phenomenology, not a metaphysical or teleological superiority of a species within some absolute *scala naturae*. We are not sure of being the only creatures that qualify for that glorious miracle (assuming that we actually do) and, even if we do, pointing would be just one of its contingent conditions of possibility, not its providential mark. After all, in spite of the flattering primacy associated to pointing, this gesture resembles more a conquest of the mortals than a divine gift.

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REFERENCES

- Bates, E., Camaioni, L., & Volterra, V. (1975). Performatives prior to speech. *Merrill-Palmer Quarterly*, 21:205–226.
- Bigelow, A.E. (2003). The development of joint attention in blind infants. *Development and Psychopathology* 15 (2):259–275.
- Cappuccio, M., Shepherd, S. (2012). “Pointing Hand: Joint Attention and Embodied Symbols”, in Z. Radman (ed.), *The Hand. An Organon of the Mind*, MIT Press, Cambridge MA.
- Cappuccio, M., Wheeler, M. (2010). “When the Twain Meet: Could the Study of Mind be a Meeting of Minds?”, in J. Chase, E. Mares, J. Reynolds and J. Williams (eds.), *On the Futures of Philosophy: Post-Analytic and Meta-Continental Thinking*, Continuum, 125–144.
- Cappuccio, M., Wheeler, M. (2011). “The Sign of the Hand. Symbolic Practices and the Extended Mind”, in *Versus. Quaderni di Studi Semiotici*, 106, Bologna.
- Cappuccio, M., Wheeler, M. (2012). “Ground-level Intelligence: Inter-context frame problem and dynamics of the background”, in Z. Radman (ed.), *Knowing without Thinking. Mind, Action, Cognition and the Phenomenon of the Background*. Palgrave Macmillan.
- Carpendale, J.I.M., & Carpendale, A.B. (2010). The development of pointing: From personal directedness to interpersonal direction. *Human Development*, 53, 110–126.
- Carpenter, M., & Call, J. (2013). How joint is the joint attention of apes and human infants?, in H. S. Terrace & J. Metcalfe (Eds.), *Agency and joint attention*. New York: Oxford University Press.
- Chu, M., & Kita, S. (2008). Spontaneous gestures during mental rotation tasks: Insights into the microdevelopment of the motor strategy. *Journal of Experimental Psychology: General*, 137(4), 706–723.

- Chu, M., and Kita, S. (2011). The nature of gestures' beneficial role in spatial problem solving. *Journal of Experimental Psychology: General*, 140(1), 102–115.
- Clark, A., & Chalmer, D., (1998). The extended mind, *Analysis* 58: 7–19.
- Clark, A. (2013). Gesture as thought, in Z. Radman (ed.), *The Hand. An Organon of the Mind*, MIT Press, Cambridge MA.
- De Jaegher, H, di Paolo, E., (2007). “Participatory sense-making: an enactive approach to social cognition”, *Phenomenology and the Cognitive Sciences*, 6: 485–507.
- De Jaegher, H., di Paolo, E., and Gallagher, S. (2010). Does social interaction constitute social cognition? *Trends in Cognitive Sciences* 14 (10): 441–447.
- di Paolo, E.A., (2005). “Autopoiesis, adaptivity, teleology, agency”, *Phenomenology and the Cognitive Sciences*, 4: 429–452.
- Dreyfus, H. L. (2002). Intelligence Without Representation: Merleau-Ponty's Critique of Mental Representation. *Phenomenology and the Cognitive Sciences* 1:367–83.
- Gallagher, S., & Hutto, D. (2008). “Understanding others through Primary Interaction and Narrative Practice”, in T. Zlatev, T. Racine, C. Sinha, & E. Itkonen, *The Shared Mind: Perspectives on Intersubjectivity* (pp. 17–38). Amsterdam: John Benjamins.
- Gallagher, S., (2005). *How the Body Shapes the Mind*, Oxford: Clarendon.
- Gibson, J.J. (1977), The Theory of Affordances, in R., Shaw, and J., Bransford (eds) *Perceiving, Acting, and Knowing*, Hillsdale, NJ: Erlbaum.
- Goldin-Meadow, S., & Butcher, C. (2003). Pointing toward two-word speech in young children, in S. Kita (Ed.), *Pointing: Where language, culture, and cognition meet* (pp. 85–107). Mahwah, NJ: Earlbaum Associates.
- Goldstein, K., & Gelb, A. (1918). Psychologische Analysen hirnpathologischer Falle auf Grund von Untersuchungen Hirnverletzter. *Zeitschrift fur die gesamte Neurologie und Psychiatrie*, 41, 1–142.
- Gordon, P.E. (2004). Continental divide: Ernst Cassirer and Martin Heidegger at Davos 1929–An allegory of intellectual history, *Modern Intellectual History*, 1, 219–248.

- Grice, H. P. (1957). Meaning. *Philosophical Review*, 66:377–388.
- Harris, P. (1996). Desires, beliefs, and language, in *Theories of Theories of Mind*, 200–222, ed. P. Carruthers and P. Smith. Cambridge: Cambridge University Press.
- Heidegger, M. (1951–2). What calls for Thinking?, in *Basic Writings*, San Francisco: Harper, 365–393.
- Heidegger, M., (1927). *Being and Time*, trans. J. Macquarrie and E. Robinson, Oxford: Basil Blackwell.
- Hutto, D. (2011). Elementary mind minding, enactivist-style, in *Joint Attention: New Developments in Philosophy, Psychology, and Neuroscience*, 307–341, ed. A. Seemann. Cambridge, MA: MIT Press.
- Hutto, D., Myin, E. (2012). *Radicalizing Enactivism: Basic Minds Without Content*, MIT Press.
- Ikaheimo, H. (2010). Is 'recognition' in the sense of intrinsic motivational altruism necessary for pre-linguistic communicative pointing?, in W. Christensen, E. Schier, and J. Sutton (Eds.), *ASCS09: Proceedings of the 9th Conference of the Australasian Society for Cognitive Science* (pp. 145-153). Sydney: Macquarie Centre for Cognitive Science.
- Kelly, S.D., (2002). Merleau-Ponty on the Body, *Ratio (new series)*XV 4 December.
- Kendon, A. (2004). *Gesture: Visible Action as Utterance*. Cambridge, MA: Cambridge University Press.
- Kita, S. (ed.) (2003). *Pointing: Where Language, Culture, and Cognition Meet*. Mahwah, NJ: Lawrence Erlbaum.
- Kiverstein, J., & Wheeler, M. (eds.) (2012). *Heidegger and Cognitive Science*. Palgrave Macmillan.
- Leavens, D. A. (2004). Manual deixis in apes and humans. *Interaction Studies: Social Behaviour and Communication in Biological and Artificial Systems* 5:387–408.
- Leavens, D. A. (2012). Joint attention: Twelve myths, in *Joint Attention: New Developments in Philosophy, Psychology, and Neuroscience*, ed. A. Seemann. Cambridge, MA: MIT Press.

- Leavens, D. A., and Racine, T. P. (2009). Joint attention in apes and humans: Are humans unique?, in *Journal of Consciousness Studies* 16 (6–8):240–267.
- Leavens, D. A., Bard, K. A., & Hopkins, W. D. (1996). Indexical and referential pointing in chimpanzees (*Pan troglodytes*), *Journal of Comparative Psychology*, 110(4), 7.
- Liszkowski, U., Carpenter, M., and Tomasello, M. (2007). Pointing out new news, old news, and absent referents at 12 months, *Developmental Science* 10:F1–F7.
- Liszkowski, U., Carpenter, M., Striano, T., and Tomasello, M. (2006). 12- and 18-month-olds point to provide information for others, *Journal of Cognition and Development* 7:173–187.
- Liszkowski, U., M. Carpenter, A., Henning, T., Striano, and Tomasello, M. (2004). Twelve-month-olds point to share attention and interest, *Developmental Science* 7:297–307.
- Liszkowski, U., Schaefer, M., Carpenter, M., & Tomasello, M. (2009). Prelinguistic infants, but not chimpanzees, communicate about absent entities. *Psychological Science* 20:654–660.
- McNeill, D. (1992). *Hand and mind: what gestures reveal about thought*. Chicago, IL: University of Chicago Press.
- Menary, R. (ed.) (2012). *The Extended Mind*, Cambridge (MA): MIT Press.
- Merleau-Ponty, M. (1945). *Phénoménologie de la perception*, Paris: Gallimard, *Phenomenology of Perception*, trans. Donald A. Landes (New York: Routledge, 2012).
- Meunier, H., Prieur, J., Vauclair, J. (2013). Olive baboons communicate intentionally by pointing, *Anim Cogn.* 16:155–163.
- Milner, A.D., & Goodale, M.A., 1995 *The Visual Brain in Action*, Oxford: Oxford University Press.
- Peacocke, C. (2005). Joint attention: Its Nature, reflexivity, and relation to common knowledge, in *Joint Attention: Communication and Other Minds*, 298–324, ed. N. Eilan, C. M. Hoerl, T. McCormack, and J. Roessler. Oxford: Oxford University Press.
- Povinelli, D. J., Bering, J. M., & Giambrone, S. (2002). Chimpanzees’ “pointing”: Another error of the argument by analogy?, in *Pointing. Where Language*,

Culture, and Cognition Meet, 35–68, ed. S. Kita. Mahwah, NJ: Lawrence Erlbaum.

- Radman, Z. (ed.) (2013). *The Hand, an Organ of the Mind: What the manual tells the mental*. MIT Press: Cambridge MA.
- Rowlands, M. (2010). *The New Science of the Mind: from Extended Mind to Embodied Phenomenology*, Cambridge Mass.: MIT Press.
- Seemann, A. (ed.) (2011). *Joint Attention: New Developments in Philosophy, Psychology, and Neuroscience*. Cambridge, MA: MIT Press.
- Shepherd, S.V., & Cappuccio, M. (2011). Sociality, Attention and the Mind's Eyes. In *Joint Attention: New Developments in Philosophy, Psychology, and Neuroscience* (ed. A Seemann), Cambridge MA: MIT Press.
- Shepherd, S.V. (2010). Following gaze: Gaze-following behavior as a window into social cognition., 5. In *Frontiers in integrative neuroscience* 4 (March).
- Tallis, R. (2011). *Michelangelo's finger. An exploration of everyday transcendence*. Atlantic books.
- Thompson, E. (2007). *Mind in life: biology, phenomenology, and the sciences of mind*, Cambridge (MA): Harvard University Press.
- Tomasello, M. (2006). Why don't apes point?, in *Roots of Human Sociality: Culture, Cognition and Interaction*, 506–524, ed. N. J. Enfield and S. C. Levinson. Oxford: Berg.
- Tomasello, M. (2008). *Origins of Human Communication*. Cambridge, MA: MIT Press.
- Tomasello, M. (2009). *Why We Cooperate*. Cambridge, MA: MIT Press.
- Tomasello, M., Carpenter, M., Call, J., Behne, M. T., and Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences* 28:675–735.
- Varela, F.J., Thompson, E., & Rosch, E., (1991) *The Embodied Mind: Cognitive Science and Human Experience*, Cambridge (MA):MIT Press.
- Vygotsky, L.S. (1962). *Thought and Language*. Cambridge MA: MIT Press.
- Wheeler, M. (2005) *Reconstructing The Cognitive World: The Next Step*, Cambridge (MA): MIT Press.

Wheeler, M. (2013). Is cognition embedded or extended? The case of Gestures, in Z., Radman (ed.) *The Hand, an Organ of the Mind: What the manual tells the mental*. MIT Press: Cambridge MA.