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Writing in Mind
Introduction to the Special Issue of AVANT

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According to the "extended mind" thesis, a significant portion of human cognition does not occur solely inside the head, but literally extends beyond the brain into the body and the world around us (Clark & Chalmers 1998; Clark 2003, 2008; Wilson 1995, 2004; Rowlands 1999, 2010; Menary 2007, 2012; Sutton 2010; Theiner 2011). One way to understand this thesis is that as human beings, we are particularly adept at creating and recruiting environmental props and scaffolds (media, tools, artifacts, symbol systems) for the purpose of solving problems that would otherwise lie beyond our cognitive reach. We manipulate, scaffold, and re-design our environments in ways that transform the nature of difficult tasks that would baffle our unaided biological brains (e.g., math, logic, sequential problem-solving) into simpler types of problems that we are naturally much better equipped to solve. A central tenet of the "extended mind" thesis, then, is that "much of what matters for human-level intelligence is hidden not in the brain, nor in the technology, but in the complex and iterated interactions and collaborations between the two" (Clark 2001: 154). Over the past fifteen years or so, the "extended mind" thesis has become a hot ticket in the philosophy of mind. As with all great ideas, the thesis was hardly conceived *ex nihilo*, but builds on, and re-articulates many earlier strands of thought. Unfortunately, many of those cognate strands have become marginalized in contemporary philosophy of mind and psychology, and do not receive the amount of attention they deserve. Part of what we hope to accomplish with this special issue is to reverse this trend, and to rekindle the dialogue between the "extended mind" thesis and its historical predecessors.

A frequently referenced interlocutor in this conversation is the Belarusian psychologist Lev Vygotsky (1896-1934), who clearly recognized the importance of "scaffolding" our environment as a recipe for cognitive success in the human species. Vygotsky considered both physical as well as psychological tools

as mediating the relationship between human beings and their environment. For example, hunting an animal with bow and arrow rather than using one's bare hands transforms a more elementary form of "impulsive" behavior directly aimed at the object of desire into an "instrumental" activity mediated by the deliberate control of a weapon. In similar vein, Vygotsky argued that the use of psychological tools brings about a shift from our reliance on (what he called) elementary to so-called higher, more advanced psychological functions: "The central characteristic of elementary functions is that they are totally and directly determined by stimulation from the environment. For higher functions, the central feature is self-generated stimulation, that is, the creation and use of artificial stimuli which become the immediate causes of behavior" (Vygotsky 1978: 39). For Vygotsky, the key element in the psychological evolution "from primitive to cultural man," as he puts it, is that "[c]ultural man does not have to strain his vision to see a distant object – he can do it with the help of eyeglasses, binoculars, or a telescope; he does not have to lend an attentive ear to a distant source, run for his life to bring news, – he performs all these functions with the help of those tools and means of communication and transportation that fulfill his will. All the artificial tools, the entire cultural environment, serve to 'expand our senses'" (Vygotsky & Luria 1993: 169).

Drawing partly on Vygotsky's insights into cognitive tool use, including the ways in which tools also re-structure the social relationships among their users, Donald Norman (1991: 17) introduced the concept of a *cognitive artifact* as referring to "those artificial devices that maintain, display, or operate upon information in order to serve a representational function and that affect human cognitive performance." Examples of cognitive artifacts are instruments that serve the offloading of information (e.g., memos, to-do lists), generate useful information (e.g., compass), enable external forms of representation-transformation (e.g., mathematical formalisms) or serve as active sources of information processing (e.g. word-processing software). The generation and use of properly designed cognitive artifacts is a powerful way to "overclock" our biological brains because they allow us to distribute cognition in space, time, and across people (Hutchins 1995; Salomon 1996; Hollan, Hutchins, & Kirsh 2000; Perry 2003; Harnad & Dror 2008).

Viewing language as a kind of "ultimate" cognitive artifact has led a number of philosophers, psychologists, and cognitive scientists to revive the constructivist thesis (also pioneered in the 1930s by Vygotsky) that language as a symbolic medium is not just an expedient tool for expressing and communicating ideas, but also functions as a partly externalized, material vehicle of thought. Some cognitive functions of language that have recently been explored from this neo-constructivist perspective include its potential for (i) influencing our categorizations of space, time, events, and people in language-specific ways, (ii) re-labeling perceptually grounded categories in ways that supports the discovery of more abstract, higher-order patterns, (iii) using self-directed lin-

guistic rehearsal as an externalized control loop to direct our attention and facilitate on-line action planning, (iv) acquiring otherwise unavailable forms of data manipulation and cognitive expertise such as formal logic or mathematics, (v) serving as cognitively stable and manipulable targets for metacognition, i.e., the ability to consciously reflect on, evaluate, and control the contents of our own thoughts, (vi) expanding the space of coordinated social interaction in space and time, (vii) directing the real-time allocation of joint attention in dialogues, and (viii) developing and maintaining a shared higher-order situation awareness to support joint action (Dennett 1993, 2000; Clark 1996; Jackendoff 1996; Clark 1998, 2006; Boroditsky 2006, Roepstorff 2008, Tylén et al. 2010, Iriki & Taoka 2012, Ansari 2012; Fusaroli, Gangopadhyay, & Tylén 2013).

Despite the current revival of the Vygotskyan approach to language, their main philosophical proponents– most notably, Daniel Dennett and Andy Clark – have made surprisingly little effort in distinguishing the cognitive benefits derived from *speech* from the psychological and conceptual implications of *literacy*, especially the literate practices of reading and writing with an alphabetic script. As a rare exception, Clark (1998: 182) noted that our use of spoken language may be as biologically proper to a human being as the use of webs is to a spider, whereas the use of written text may be more properly conceived as a genuine cognitive artifact. But for the most part, speech and writing are treated more or less interchangeably as "discrete, arbitrary, and essentially context-free" symbol edifices whose primary computational value is to either re-configure (Dennett) or to complement (Clark) the biologically basic modes of information-processing that are endemic to our brains. Such a shortcoming reflects what Linell (2005) has diagnosed as a "written language bias," i.e., a marked tendency to insist on the theoretical primacy of spoken language, yet to characterize its features from a vantage point that is historically conditioned by our immersion into a literate culture (for a criticism of Clark along these lines, see Steffenson 2011).

As sympathetic advocates of the language-as-a-tool perspective, we believe that this blind spot needs to be addressed lest we allow the "extended mind" thesis to be put in a double jeopardy of sorts. On the one hand, characterizing the dynamic flow of speech through the static lens of an alphabetic script tends to obscure the cognitive dynamics of "languaging" (Cowley 2007, 2011) as an embodied, situated, and dialogical activity. At the same time, however, one can hardly exaggerate what tremendous impact the cultural evolution of writing and communication technologies in general has had not only on the organization of human societies, but also the use of mental and linguistic faculties by competent members of literate societies. To accommodate these two contrary but clearly not incompatible viewpoints, we need more differentiated accounts of language and literacy as two distinct types of cognitive artifacts (Menary 2007, Logan 2007, Theiner 2011). To move this agenda forward, our

special issue aims to confederate the cognitive-scientific framework of the "extended mind" thesis and the media-theoretic framework of "literacy theory."

Starting in the 1960s, the "literacy hypothesis" grew out of a largely Canadian tradition of medium theorizing, associated mostly with the Toronto School of Communication. Much like Vygotsky, they highlighted the idea that communication technologies have medium-specific cognitive and social effects that are responsible for the emergence of numerous psychological and cultural phenomena (Innis 1950; McLuhan 1962, 1964). Building on the work of earlier media theorists, Havelock (1963) and Goody and Watt (1963) focused particularly on the impact of literacy. They argued that the onset of phonetic writing in Ancient Greece spurred the rise of highly abstract forms of knowledge and rationality associated with the Western tradition. What exactly were the distinctive cognitive effects, then, which literacy theorists attributed to the medium of alphabetic writing, and how are they different from effects that are also enabled by other forms of writing or perhaps by any form of visually persisting representation? Unfortunately, the "first wave" of literacy theorists was not always entirely perspicuous of these distinctions; however, it is possible to cull a complex of three interrelated and frequently mentioned features from their writings.

First, as a practice of higher-order symbolization, written language is an inherently meta-linguistic system which codifies and thus objectifies speech. While a speaker uses language primarily to talk about people and things in the world, a writer concerned with the transcription of speech is primed to turn language itself into an object of mental scrutiny. While this is true of writing systems in general, phonetic writing is uniquely poised to enhance one's metalinguistic awareness because of two features: first, the arbitrariness of the connection between letters and sounds; second, the level of phonemic awareness that is necessary to identify systematic correspondences between recurring parts of speech and a relatively small repertoire of discrete, repeatable characters. Second, phonetic writing affords a much greater degree of verbal abstraction than speaking. For the most part, the verbal abstractions in non-literate cultures tend to be limited in scope and bound to specific contexts, invoking categories that refer to concrete features of reality and that are driven by practical demands. But because writing makes speech visually available, the same cognitive operations of verbal abstraction that speakers use to classify things can now be brought to bear directly upon words. Again, it is the arbitrariness of phonetic writing which decisively breaks the perceptual bonds between a symbol and the concrete image of what it stands for. Thus, the phonetic script defines a radically new search space for the discovery of higher-order linguistic categorizations that are thoroughly disconnected from the everyday contexts in which language would normally be used. Finally, all of this made phonetic writing well-suited as a medium in which highly

decontextualized, metalinguistic forms of discourse such as Greek metaphysics, epistemology, or syllogistic logic were able to flourish.

To many critics, this story sounded a bit too neat to be true. After its heyday in the 1960s and 1970s, the initial popularity of the literacy hypothesis began to wane, since it became increasingly clear how difficult it is to single out the cognitive implications of literacy from the social, political, and economic contexts in which literate practices are necessarily embedded. Based on a series of cross-cultural studies, Scribner and Cole (1981) argued that the cognitive effects that had previously been attributed to literacy were in fact brought about by Eurocentric forms of education, particularly schooling, rather than alphabetic writing as such. Detailed research by social historians such as Graff (1987) showed that literacy effects are mediated by a large numbers of political, economic, and institutional factors, cautioning us against treating literacy as a quasi-autonomous agent of cultural and historical change. Orthodox versions of the literacy thesis continue to be criticized for their deterministic view of cultural change (Brockmeier 2000), and for their Eurocentric sentiments about the intellectual triumphs of Western civilization (Greenfield 1983).

The "second wave" of literacy theorists attempted to respond to these mounting criticisms by revising or otherwise refining their original claims (Ong 1982, Logan 1986, Goody 1987, Harris 1989, Olson 1994). Some of them (e.g., Ong 1982, Logan 1986; cf. below) continued to attribute fairly wide-ranging cultural, social, and cognitive effects to the advent of alphabetic writing. Others, such as Goody (1987), shifted their emphasis from literacy as a representational medium to writing and reading as socially manifested practices, especially the significance of formalized education, which in itself is directly related to the spread of literate practices. Up to the present day, literacy theorists have continued to revise and hedge their claims about the cognition-enhancing effects of literate technologies. For instance, Olson (1994, 1996) has focused particularly on the effects of writing as an intrinsically metalinguistic activity. He argues that writing is not just a passive transcription of speech, but actively instills in the writer a new conceptual model of speech, by turning language from a medium that is (for the most part) transparently *used* to a medium that has to be *mentioned*. In short, writing is always a way of *quoting* what somebody has said (or would say). This induces a heightened sense of metalinguistic awareness which – both historically and developmentally, according to Olson – enforces a sharp distinction between what was said and what a speaker meant, which in turn affects the interpretive practices of ascribing intentional mental states to oneself and to others. Harris (1989) makes a similar point when he argues that writing serves up a model of "unsponsored" language in which what is said ("symbols") and what is meant ("meaning") become ossified as entities in their own right, and systematically de-coupled from the person who said it and the context in which it was ut-

tered. The medium of unsponsored language, in which words and their relationships can be decontextualized *at libitum*, opens up a discursive space which was the birthplace of abstract, purely conceptual thought. As a final example, Donald (1991) argues that the cognitive ecology of writing led to the development of a "theoretic mind" because it supported historically unprecedented forms of external memory. The process of externalizing human memory began slowly, with the creation of permanent visual symbols, but snowballed soon after the invention of writing. The spread of literacy-based mnemonic strategies gave rise to new forms of storing, indexing, sorting, summarizing, and taxonomizing information, which supported novel forms of cognitive problem-solving. Current-day computer technologies offer ever-increasing capacities for the storage and retrieval of information, and thus the amount of knowledge that a literate human being can access and at least potentially come to acquire within the span of a lifetime.

In sum, proponents of the literacy thesis share with proponents of the extended mind thesis the viewpoint that communication systems such as language or writing have cognitive implications that go beyond their purely social and communicative purposes. Conceiving of media as extensions of the mind thus has the potential to bring together and cross-fertilize research programs that are currently placed in distant corners of the study of mind, language, and society. In this issue, we bring together authors with a diverse set of interests to identify promising areas of overlap, blaze new trails for us to explore, but also to highlight dissonances and challenges that will have to be addressed in future work. Let me now give a brief thumbnail sketch of the papers that follow, all of which have specifically been prepared for this issue.

Robert Logan, a former collaborator of Marshall McLuhan who later developed his own version of the "extended mind" thesis, shows that many of Andy Clark's more recent articulations of this idea are foreshadowed in McLuhan's conception of media as "extensions of man." Immortalized in popular culture for his aphorism that "the medium is the message" and for coining the expression of the "Global Village," McLuhan's academic work is considered a cornerstone of modern media studies. McLuhan regarded all tools and technologies as extensions of our bodies, but treated communication technologies as a special case because they come to function as extensions of our psyche. As noted by Logan, McLuhan's conception of cognitive extension goes beyond Clark and Chalmers' (1998) development of this idea in at least two important respects. First, whereas Clark and Chalmers' canonical examples of extended cognition focus on solitary, albeit technologically extended activities such as doing long multiplication or recording addresses in one's personal notebook, McLuhan saw an inherent trend of electronic media to foster the creation of collective intelligence ("consciousness") that would ultimately encompass all of humanity. Second, while Clark (2008) remains committed to an "organism-centered" account of extended cognition in which the biological individual (in

particular, the human brain) firmly remains in the driver's seat, the plot of McLuhan's story takes a more sinister twist, as attested by passages such as the following: "To behold, use or perceive any extension of ourselves in technological forms is necessarily to embrace it. By continuously embracing technologies, we relate ourselves to them as servo-mechanisms" (McLuhan 1964: 55; cited after Logan, this issue). In the remainder of his paper, as well as in an exclusive interview that is published here together with his article, Logan discusses his recent books on media ecology, language evolution, and what led him to develop his own conception of the extended mind.

The paper by **Marcin Trybulec** raises a fundamental dilemma concerning the notoriously slippery concept of *media*, in particular how this notion has been defined by the Toronto School of literacy theorists. In his paper, Trybulec argues that different articulations of the thesis that literacy and other communication technologies shape the human mind oscillate between an "exclusive" and "inclusive" understanding of media. In the orthodox "exclusive" interpretation, media are conceived narrowly as material vehicles for expressing and communicating thoughts. The claim that media are important causes of cognitive and social change translates, then, to the thesis that those changes are brought about by, and structurally reflect the historical transformation of human communication technologies. Critics of the Toronto School have challenged the reification of media as seemingly autonomous agents of change, isolated from the social practices which organize and structure our engagement with them. For example, McLuhan and his followers have often been charged with espousing an implausible form of technological determinism, a simplistic "message-passing" model of communication, and an unreflective Eurocentric bias. Members of the Toronto School, in turn, have responded to this challenge in part by embracing a revisionist, more "inclusive" conception of media, defined as a set of socially structured techniques for sequestering, processing, storing, and distributing information. Technology already *is*, in this sense, an inherently social phenomenon.

After setting up this dilemma, Trybulec argues that literacy theorists are ill-advised to adopt the revisionist, inclusive understanding of media. For one, it would threaten to undermine the theoretical integrity of the Toronto School vis-à-vis alternative socio-centered and culture-centered approaches to media studies. Moreover, it is bound to trivialize their distinctive claim that communication technologies are causally privileged vehicles of cognitive and social change. He then argues that we can marshal the resources of the "extended mind" thesis to go between the horns of the suggested dilemma – i.e., salvaging an exclusive conception of media while avoiding the charge of technological determinism.

Manuela Ungureanu makes a foray into social metaphysics to help fill in some conceptual lacunae in Jack Goody's anthropological development of the

literacy thesis (Goody 1977, 1986, 1987). In his work, Goody attached great significance to writing systems as major drivers of large-scale social and intellectual change. For example, he associated with the development of literate societies the emergence of specific forms of religious practice, legal institutions, economic transactions, and scientific rationality. Many of the cross-cultural generalizations about the consequences of literacy that Goody proposed are couched in terms of being a member of a *literate society*. Pitched at a macro-social level, his generalizations tend to gloss over many historical contingencies, specific political and economic enabling constraints, ideological power struggles, and the variability of culturally specific educational practices.

Over the past few decades, Goody's penchant for macro-social theories, and his claims of an alleged "great divide" between oral and literate societies (or even minds) has come under fierce criticism by cultural anthropologists on various empirical, methodological, and conceptual grounds. Ungureanu shares the concerns of Goody's critics over the ideological subtext of proclaiming the "superiority" of literate cultures, and its association with a long history of discriminatory practices. However, she argues that many of their more specific allegations have either attacked a straw man, or at least take Goody to task for flaws that can be remedied by a more flexible, nuanced definition of *literate society*. In her paper, Ungureanu takes on three such criticisms of Goody's position: first, that any attempt to define the notion of literate society as a macro-social kind rests on a flawed "essentialist" conception of literacy; second, that the vernacular, ideologically loaded concept of literacy cannot be turned into a "scientifically respectable" kind without also taking aboard its burdensome political connotations; third, that Goody's appeal to literacy as a quasi-autonomous agent of change reeks of technological determinism. In her attempt to salvage Goody's larger project, Ungureanu defends a social-constructivist definition of literate society that accommodates both the particular set of institutionalized roles and rules governing the production and use of texts (in a given society), as well as the culturally specific body of beliefs by which members of literate societies consciously or unconsciously identify themselves. Among the virtues of her definition is that it actively invites more detailed, interdisciplinary, and politically sensitive investigations of Goody's claim that literacy functions as a "technology of the mind."

Jan Sleutels raises an interesting challenge for our standard ways of understanding the human mind in a historical perspective. He begins with the observation that our quotidian self-experience as thinking beings, expressed in terms of the vocabulary of present-day folk-psychology, is commonly taken as the privileged starting point from which to study minds in general. The minds of creatures that are increasingly distant to us, such as infants, people with severe mental disabilities, early hominids, or non-human animals are then compared to our "standard" minds by subtracting a number of missing, im-

paired, or undeveloped competencies. Underlying this "expansionist" strategy of mental state attribution is the presumption of a deep, biologically grounded psychological continuity between our minds and theirs. Taking his cue from Davidson (1999), Sleutels poses the "fringe minds" problem to question this presumption of continuity, asking "at what point do we reach the outermost fringes where standard folk psychology ceases to make sense, and a switch of vocabulary is indeed called for?"

As an illustrative example of a not-too-distant fringe mind, Sleutels discusses Julian Jaynes' (1976) ingenious yet controversial study on *The Origin of Consciousness in the Breakdown of the Bicameral Mind*. In his book, Jaynes argued that the ancient people of Mycenean Greece, Mesopotamia, and Egypt (among others) did not have conscious minds insofar as they lacked the deliberate, self-reflective, rational unity that is a characteristic ingredient of present-day folk psychology. According to Jaynes, minds only became conscious as recently as late in the second millennium BC after the breakdown of an earlier, ubiquitous "bicameral" mentality, partly as a result of the spread of writing and other language-related technologies. Using Jaynes' theory as a backdrop, Sleutels formulates a dilemma for expansionist strategies for interpreting fringe minds. On the one hand, if we simply enlarge our folk-psychological vocabulary with concepts that specifically apply only to fringe minds, the predicates that we attribute to the latter will not be recognizably *mental* from the perspective of standard folk-psychology. On the other hand, if we modify our entrenched vocabulary of standard folk-psychology, we spread our notion of the mental so thin that we become unrecognizable to ourselves as *thinking* beings. In addition, expansionists are (perhaps inadvertently) in constant danger of committing over-attribution fallacies, by populating fringe minds with attributes of present-day minds which the former do not (or did not) actually possess.

As a more unbiased alternative to expansionism, Sleutels advocates the use of "restrictionist" strategies for understanding historically nearby minds. Rather than trying to "solve" the fringe minds problem, as expansionists are wont to do, restrictionists are prepared to countenance the reality of substantial psychological discontinuities in the cultural making of the modern mind. Or, as Sleutels aptly puts it, "the primary purpose of searching for fringe minds as close to home as possible is to identify what is distinctly 'modern' about the mind as conceived by current Western folk psychology."

Drawing on an ongoing cognitive ethnographic study of dance creation by expert practitioners, the programmatic paper by **David Kirsh** demonstrates how the central themes of embodied cognition can be fruitfully merged to stimulate applied research in Human-Computer-Interaction (HCI). This counterbalances a recent trend among philosophers to caution against using the generic term "embodied cognition" to describe what is in reality a heteroge-

neous slew of research frameworks, united mostly by their opposition to the Cartesian mold of classical cognitivism. As part of this trend, it has become fashionable to distinguish four (or more) spokes in the wheel of "4e" (*e*mbodied, *e*mbedded, *e*xtended, and *e*nactive) cognition (Menary 2010, Rowlands 2010, Shapiro 2011, Wilson & Foglia 2011). This laudable appreciation of diversity is clearly a positive sign for the coming of age of the embodied cognition movement, and much philosophical work remains to be done spelling out consensus and dissent among these overlapping threads of research.

However, as Kirsh's convincing juxtaposition of experimental data with careful analysis reveals, we should not miss the forest for the trees. This is particularly true when we ask embodied cognitive science to orient and steer practitioners of HCI, where the philosophical rubber has to meet the digital designer's road. As Kirsh puts it, "[g]ood design needs good science fiction; and good science fiction needs good cognitive science" (this issue). Importantly, Kirsh's point here is not merely a matter of pragmatics, as he makes clear with a reference to the nowadays all-too-familiar activity of channel surfing. In the envisioned "magical future" of interaction-enriched cognitive artifacts, our immersion in more realistic and personalized digital environments will lead to emergent cognitive behaviors which, in turn, expand the scope of phenomena that cognitive science will have to explain. Thus, the embodied cognition program not only informs, but is also informed by future developments in HCI.

What are these unifying themes, then, which the frameworks of distributed and embodied cognition have brought to the fore? First, interacting with tools literally changes the way in which we think and perceive, as tools become "absorbed" into the neural representation of our body scheme. This is true not only in the fairly uncontroversial sense that a blind man's cane provides otherwise inaccessible tactile experiences by extending his perceptual apparatus. More importantly, and building on the Gibsonian insight that perception is always structured by the action capabilities of a perceiver, tools afford new tasks and activities that alter the goal-oriented "enactive landscape" that human beings perceive and inhabit. Second, we strategically rely on the morphology and movement of our bodies to take on causally significant or constitutive roles in cognitive processing. For example, dancers who practice new dance moves make ample use of "marking," which refers to a partial, selective rehearsal of certain aspects of an intended movement. As Kirsh's study shows, the method of marking is not only superior to mentally simulating the dance phrase entirely in one's head, but – perhaps more surprisingly – leads to better results than working "full-out" on the complete, undistorted movement. Kirsh suggests that marking creates a temporary, embodied scaffold in which the body shoulders part of the cognitive burden by helping the dancer to manage her attention, improve her focus, and facilitate the internal motor simulation of the full movement.

As noted by Kirsh, the epistemic benefit accrued from marking or, more generally, from similar gestural and bodily scaffolds is quite different from the aforementioned cognitive functions of writing and other visually permanent symbol systems. A key benefit of writing is to take something that is fickle and transitory, and convert it to something that is more stable and permanent. But when compared to the "full-out" rehearsal of dance phrases, it turns out that marking is a cost-effective strategy for the opposite reason. It trades in the dynamic complexity of a complete, but unnecessarily fine-grained movement for the simplicity of a dynamically reduced yet structurally more salient bodily posture.

Third, in order to achieve mastery over complex movements, doing is better than merely observing, notwithstanding the fact that observers are known to internally simulate the perceived movements of others as if they were performing them themselves. This is because by overtly executing (rather than just covertly simulating) a complex movement, the dancers are able to elicit the full range of kinesthetic feedback that is requires to fine-tune their motor control of the desired movement, but also to improve their enactive understanding of a phrase during the process of creating a dance. Fourth, what is true of our bodies is equally true of objects that we use to think with. For example, on occasions when there is too much uncertainty in how the internal simulation of a situation is going to unfold, people tend to "rely on the world to simulate itself and in doing so [...] stimulate themselves" (Kirsh, this issue) – e.g., by twisting the cap of a beer to see whether it will come off. If it is true that much of inner thinking is simulation, then the strategic manipulation of our bodies and external objects for the purpose of performing an external simulation should count as thinking no less (cf. the "parity principle" in Clark & Chalmers 1998).

Our special issue ends with a crescendo when **Andrzej W. Nowak** calls up our ontological imagination to usher in a new era of critical, socio-politically engaged ("phronetic") social science, built on a merger between Critical Sociology and Science and Technology Studies. Nowak admonishes contemporary social science for its incompetence and lack of interest in dealing with pressing social and political issues that we face today. As the main source of this deplorable state of disconnect between academe and human praxis, Nowak follows Latour, Beck, and others in blaming the continued allegiance of social scientists to an outdated vision of social ontology. According to that vision, social realities can be sliced into autonomous "subsystems" such as culture, politics, economics, science, and religion which are analyzed in isolation from each other. By adhering to this "modernist" assumption, the social sciences find themselves ill-equipped to deal with complex problems such as ozone depletion, anti-vaccination movements, or religious revivalism which cut across traditional spheres of influence.

To overcome this ontological impasse, Nowak promotes the use of our *ontological imagination*, a notion which he develops in analogy to Mills' (1959) concept of sociological imagination. For Nowak, ontological imagination refers to the human ability to recognize the social and historical situatedness of our being, and, at the same time, to envision the movement which allows for it to be transcended. From a methodological perspective, working with ontological imagination would mean that social scientists ought to be adept at operating with multiple frames of reference and diligent in choosing the right frame at the right time. The first aspect requires a resolutely interdisciplinary academic training; the second aspect requires practical wisdom (*phronesis*). As a way of "politicizing" knowledge, Nowak's turn to the ontological imagination is thus ultimately an attempt to reconcile the cognitive attitude of scientific thinking with the critical attitude of political engagement.

As a fitting example of how a continued *lack* of ontological imagination can lead to professional tunnel vision, Nowak marvels at the almost complete absence of critical reflection on the linguistic, conceptual, and cognitive implications of literacy in mainstream analytic philosophy of language. Why would a field whose original *raison d'être* was to turn the language of philosophical discourse into its main object of reflection be so blissfully unaware of how much it owes to the medium of *written* language? It would seem that by ignoring the social and institutional realities of literacy, philosophers of language fail to theorize an important precondition of their own mode of thinking. "A spiteful answer comes to mind: tools as mediators in the Latourian sense were so transparent for them as to become invisible" (Nowak, this issue).

This concludes my preview of our special issue. It calls for a renewed dialogue between media theory and cognate strands of 4e-cognition. With writing in mind, we hope others will heed our call.

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