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Constructing the Mind Relative to its Relationship to a body interacting with the World

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ABSTRACT

Conventional cognitive science conceived of the mind as a system that processed abstract information, having a relationship with the outside world that was of near inconsequential import. Perceptual and motor functions did not count in understanding cognitive processes. In cognitive psychology, knowledge was restricted to the propositional. In artificial intelligence, computer models busied themselves predominantly with processing abstract symbols. In philosophy, concepts were no more than abstract symbol systems. The philosophy of mind became the philosophy of propositional concepts. Fodor (1983) insisted cognition was not modular, though its links to the world were (modularity hypothesis). The perceptual-motor processing bore only curtailed informational input and output. Alternatively, we have in our day an embodied way of conceptualizing cognition that admits, in its various facets, that cognitive processes are extensively grounded in the body's interactions with the outside world, on sensory-motor processing. It is no longer a mind that goes about rectifying abstract tasks; it is now a body needing the solidarity of mind to do its chores. Well back in the 1890s, William James was already advancing an ideo-motor theory of perception. Jean Piaget (1950) showed how cognitive abilities arose from sensory-motor abilities. J. J. Gibson (1979) insisted in his ecological cognition that perception entailed direct interaction with the environment. Behavior afforded behavior, he held (Gibson, 1979, 135)[1].

Introduction

Thus, it could well be that we must construe the mind relative to its relationship to a body interacting with the world. The argument made is that humans have evolved from lower beings that basically confined their neural resources to motor and perceptual processing, and mainly applied their cognitive abilities to immediate interaction with the environment. Therefore, cognition may be deeply ingrained in sensory-motor processing, instead of being abstract, centralized, separated from peripheral modules of input and output. Margaret Wilson (2002) has singled out six major notions of the embodied cognition.

A. Embodied Way of Conceptualizing Cognition

(i) ***Cognition is situated***

Cognitive activity, this view holds, is situated activity. The dynamic systems of Thelen & Smith (1994) and others also hold this view. Cognition happens in the "context of a real-world" matrix; and naturally includes perception and action. It occurs in an environment of "task-relevant inputs and outputs." As a cognitive operation is in progress, they explain, perceptual information keeps trickling in, affecting processing, and motor action is done, affecting the environment in manners that are relevant to the task. An example of a cognitive operation that is situated in this manner is walking about on a piece of land and having a feel of it while attempting to figure out (mentally) where to site a building.

Proponents of this view argue that before mankind attained civilization, mental abilities only survived when they helped man respond directly to immediate situational needs, such as food gathering and predator avoidance. Hence, even when not mirrored in the psychedelic and cosmetic ventures of contemporary man, our basic cognitive architecture could well be characterized by situated cognition.

(ii) ***Cognition is time-pressured***

Cognition happens in real-time and must cope with time-pressure. Thus, it has to be understood in relation to how it operates under the pressure of interacting in real-time with the surroundings. Conventional robots have the singular privilege of manipulating internal representations of events at their leisure; devoid of "runtime" constraints. In contradistinction to conventional artificial intelligence, behavior-based robots have been constructed that attempt to show real-time responsiveness to environmental feedbacks, such as hitch-freely finding their way in unorganized milieus. Though these robots may not be intelligent in themselves, they reveal current sensibility for the situated environment and "runtime" constraints under which humans operate (Brooks, 1991, 1227-1232).

Time-pressure is a factor in that it highlights "representational bottlenecks". Life circumstances, the argument goes, often require swift and endlessly unfolding responses. We run short of time needed for raising a complete environmental model, from which an action plan could be obtained. Thus, as situated *cognizers* we employ, on the spot, 'economical' and effective tricks to provide behaviors appropriate to the circumstances. There are even doubts of the existence of internal representations (Beer, 2000). Real-time interaction with the environment is definitely a factor in cognition, as perceptual-motor coordination makes clear. Elemental behaviors, such as running can hardly do without a confluence of the perceptual and the motor, a confluence involving interaction in real time, with all the attendant time pressure.

(iii) ***We unload cognitive work unto the environment***

We galvanize the environment to keep or sometimes to manage information for us; and we subsequently reap the fruit of the information as the need arises. This, the view holds, follows from the limitations of our information-processing capacity (e.g., working memory and attentional capacity). To lessen the cognitive workload, we exploit the environment.

When compelled to function on-line, the argument goes, it is not the rule that we disintegrate. We may either fall back on "pre-loaded representations" accumulated via previous knowledge; or we reduce the cognitive workload by strategically exploiting the environment. In the later case, we avoid taking the required time to sufficiently encode the information. We rather leave information "out there" in the environment, and access it as the need arises. Then, we utilize *epistemic* activities to alter the environment so as to trim down the remaining cognitive labor. Thus, instead of mentally computing (and only later carrying out) where to place my new bookshelf, I move around my room to have a feel of it and discover where to site the shelf. Or, I may decide to lay out the parts of the shelf I intend to assemble in about the same spatial relations and order I intend them to take in the end (Glenberg & Robertson, 1999).

(iv.) ***The Environment is part of the Cognitive System***

Taken in isolation, the mind can hardly be a revealing unit of analysis. This is so because the flow of information between the world and the mind is steady and much. Mind, body, and the environment, each belonging to the interacting situation, form part of cognition. The forces that propel cognitive behaviors are distributed across these three as they interact, rather than residing in the mind alone (Thelen & Smith, 1994, 17, Clark, 1998, 513-516).

(v) ***Cognition is for action***

The mind's function is the direction of action. Thus cognitive mechanisms (e.g., perception, memory) are better comprehended in relation to their contribution to "situation-appropriate behavior". Vision, so the argument, evolved to enhance motor functions. Memory evolved to serve perception and action (Glenberg, 1997, 1).

Tradition has it that the goal of vision is the construction of an internal representation of the world we perceive. Higher cognitive areas use this representation for their operations. Thus the brain's ventral visual stream, the "what," gives us the representation of the structure of an object. The brain's dorsal pathway, the "where," on the other hand, affords us only the spatial relations between objects. This view is in our day becoming increasingly anachronistic. The dorsal pathway, now called the "how" pathway, is said to serve visually directed actions (Goodale & Milner, 1992).

Studies on priming seem to reinforce this view. Researchers report that some visual inputs prime motor functions. Viewing an object of a certain orientation eases grasping on a later grasping task, once the new object has common orientation with the previous one (Craighero *et al.*, 1996). The priming results even if the orientation of the previous object fails to accurately estimate that of the new one. What is more, even without any actual demand for task, visual inputs have been found to trigger motor representations that lie under the surface. Experiments with monkeys reveal motor neurons associated with the control of tools firing in response to tools shown to the monkeys.

In their experiments with humans, Craighero and his colleagues find that drawings visually similar to the objects their subjects want to grasp significantly lessen the reaction time for grasping. They hold this to mean a proof for visuomotor priming. Presenting a visual prime, whose orientation is similar to the needed grip movement, facilitates the reaction time for the movement. Looking at an object makes easier a motor behavior similar to its visual properties. To explain the visuomotor transformation involved in the complex motor behavior of grasping, it is argued that seen objects are motorically described**,** given the strong link between their physical features and motor behavior (Craighero *et al.*, 1996, 347).

Of remarkable interest in the experiments of Craighero *et al.* is the finding that even when motor response is "predetermined and ready" to be carried out, the motor system still retains the capacity to take in environmental stimuli. Thus, it would seem that appropriate visual information is transformed into an object-determined motor command, so to say, even when response is not needed. The visual input primes the appropriate response spontaneously. In the light of their experiments, Craighero and his colleagues conclude that visual information elicits object-related motor behavior. It is a mechanism, they hold, that serves the speedy selection of object-related behaviors. This "automatic visuomotor transformation" could enhance the effectiveness of our motor system as it interacts with perceived and unperceived objects (Craighero *et al.*, 1996, 349).

Fadiga & Craighero (2003) report that in humans action-related sensory-motor transformations rather than being confined to visual stimuli, extends to acoustic stimuli as well. A region of the premotor cortex responds to sensory information that is related to actions. In this premotor region, various forms of sensory information (e.g. seeing a person running or hearing a friend beckon on us) evoke action representations. When an action is induced by visual or acoustic stimuli this region resonates, internally drawing one to the doorsteps of "overt movement." This activates mimicry of running, for instance, and makes one articulate what is heard. Fadiga and Craighero suggest that a mirror system of this kind could be pertinent for interpersonal relations (Fadiga & Craighero, 2003, 523). They say this brain region that compares one's brain with other persons' motor representations enables one to "automatically understand" the actions one perceives, given that one has the power to replicate the same action.

Fadiga, Craighero, and Olivier (2005) show that our motor system stimulates the action we observe and the things we hear in ways that are "strictly" similar to the stimuli (Fadiga, Craighero, and Olivier 2005, 217). Our perception of other people's actions comes along with the "motor facilitation" of our corticospinal system. This facilitation is there as we observe actions, listen to sounds related to actions, or pay attention to speech.

In the same vein, Glenberg (1997) proposes a new understanding of memory and conceptualization as subserving perception and action. Conceptualization is for the "encoding of patterns" of potential physical interaction with the world. Memory and the way our bodies and the environment are structured constrain these patterns. Concepts get to relate to one another given the way separate patterns of actions get combined following bodily constraints. Conceptualization is, thus, environment-driven, and action patterns supplied by memory take up supporting, but unintentional, roles.

Glenberg accounts for the various facets of memory in relation to such perceptual-motor patterns. Memory, he proposes, registers the way conceptualizations combine with one another. On the one hand, environment-based action patterns unintentionally blend with patterns built on earlier experience. This unintentional application of memory is akin to implicit or indirect memory. On the other hand, environmental patterns could be suppressed causing conceptualization to be directed by earlier experience. In this case memory is somewhat effortlessly but consciously applied. This power to suppress the patterns of the environment serves prediction, assists recall, and helps us understand language.

The conventional conception of memory as being there for "memorizing," merits, for all intents and purposes, the replacement with this new understanding. Short-term memory, for instance, is the use of specific skills of action, rather than a separate memory "system." This understanding of memory has the merit of highlighting how situations and objects are conceptualized in relation to their functional relevance to us, instead of the way they really are, as is perhaps conventionally believed. As Wilson puts it, this new and embodied way of conceptualization is reflected, among others, in the saying associated with Maslows that when all one has is a hammer everything else take up the semblance of a nail. It also reflects the *Umwelt* drawings of Uexkuell that hint at what the world could look like to beings with differing cognitive itineraries.

(vi.)***Off-line Cognition is body-based***

Most so-called centralized and abstract activities covertly utilize sensory-motor functions, whereby we manipulate the environment to facilitate our thinking about problems (e.g., mentally counting on our fingers). Mental structures, this view argues, which primarily evolved for action and perception, seem to be co-opted and they run "off-line" to help our thinking and knowing. (The structures are, as it were, disjoined from their original goal of serving physical inputs and outputs.) Thus, even when severed from the environment, the mind's operations are rooted in mechanisms (of sensory processing and motor control) whose evolutionary purposes were for interacting with the environment. Mentally counting on fingers, for instance, could take the form of letting only the priming of motor programs happen, without any visible movement. Thus sensory-motor resources could be exploited to simulate some features of the physical domain for representational and inferential purposes.

Mental imagery (visual, auditory, kinesthetic) (Parsons *et al.* 1995), is one instance of the mental stimulation of the outside world and its extra-mental events. In Kosslyn, analogue representations functionally preserve the properties of the outside world (spatial and otherwise) during imagery. Imagery does not involve propositions. In fact, in contradiction to low performance in proposition-type operations, subjects perform equally and some visual cortical areas equally get activated in both visual imagery task (closing eyes and visualizing while comparing) and visual perception task (looking at the stimuli while comparing). This implies some links between mental imagery and everyday perception (Kosslyn *et al.*, 1999).

Working memory is one more instance of simulation of extra-mental events by means of off-line application of sensory-motor resources. Pointers to the sensory-motor character of working memory abound. Among these are that we have very poor memory for words whose sounds are similar, very poor memory for lengthy words, and very poor memory when the applicable articulatory muscles are engaged in other functions. The same is true of deaf people. Deaf subjects show poor memory for sign language when hand shapes look alike or are lengthy (Wilson & Emmorey, 1997). In this way, working memory manifests itself as a form of symbolic unloading that unloads information onto the brain's perceptual-motor system, rather than onto the environment (Wilson, 2002).

Episodic memory too, insofar as it involves remembering experienced spatiotemporal and localized events, is strong evidence that long-term memory (cognition) is inseparably linked to the body's experiences and interactions with the physical world. Wilson (2002), notes that an episodic memory, especially when fresh, possesses the character of "reliving," with all the kinesthetic, spatial and visual impressions that go with it (Wilson, 2002, 633).

Implicit memory is one successful tactic for bypassing representational bottlenecks and lessening cognitive workload by exploiting predictability in functions with invariable input-output mappings. Here we automatize what was previously effortful by learning skills through constant practice. Epelboim (1997) argues that automatizing assignments in this manner minimizes unloading workload onto the environment. Hence, rather than being the opposite of controlled processing, automaticity could be a means of addressing representational bottlenecks in advance, by building up internal representations of situations that contain some regularities (Wilson, 2002, 634). Thus, implicit memory is an embodied way of knowing (Johnston *et al.,* 1985). It is also, as Wilson observes, one way through which situated cognizing takes off-line some of its workloads.

B. A Critique of Situated Cognition

There is no gainsaying the fact that cognition is situated and context-dependent. The immense range of evidence, experimental and natural, speaks for itself. Yet subscribing to situated cognition misses the mark save one simultaneously holds on tenaciously to off-line cognition. By definition situated cognition entails interaction with the objects that the cognitive operation is about. Thus, cognitive operations that are undertaken off-line, devoid of task-relevant inputs and outputs, would be by definition not situated. Remembering, daydreaming, planning in situations not directly relevant to the contents of the memories, and dreams generally belong here. Yet one of the defining characters of the human cognition is that it can happen disjoined from an immediate interaction with the environment.

Among the mental powers that turned out to be the species-defining qualities of the early humans were tool making -- to match a mental template, and "depictive" art that reveals capacity to mentally represent what is absent and do representation for its own sake. (One thinks immediately here of the astonishing paintings and carvings of the ancient Egypt and Ethiopia. The near forgetfulness, or is it seeming neglect, of these artifacts of higher cognition, in preference to the lesser valuable golden mummies of Egyptian pharos, makes one wonder whether the fever over the *materia* plaguing the wider material society has also caught up with the intellectual enterprise). These powers show the off-line character of thought. Thus, isolating situated cognition as the core principle of our cognitive architecture, as Margaret Wilson (2002) rightly observes, would be to overlook these species-defining qualities of our cognitive enterprise. Barsalou and his colleagues (2003b,) for all their giant strides, seem to run this risk. Even early human language must have served both online and offline purposes, at once situated and non-situated. Assimilating (imbibing) parental regulations on refraining from dangerous conducts and deciding whether to participate in a planned exercise are some of the instances of the combination of online and offline purposes that early language served, as Wilson correctly notes.

C. Critiquing the Emphasis on On-line Processing and the view of Cognition as Time-pressured

Contrary to claims, our cognitive system does not seem to have wholly resolved the problem of representational bottlenecks. Faced with new cognitive or perceptual-motor stumbling blocks, we tend to disintegrate under time-pressure. Given the option, we would prefer to step back, observe, assess, plan, and then act. It may well be that our cognitive system is yet to evolve a mechanism for addressing the real-time constraints of the representational bottlenecks.

Again, though all human behaviors may involve environmental input and output, much of them do not involve time-pressure, in the sense implied in real-time situated cognition. This is not to deny, though, that some intricate cases do. Yet, doing routine domestic chores, working in workplaces, undergoing a six-year primary education, doing a doctorate degree all are perceptual-motor or cognitive tasks undertaken at the leisure of the cognizing being. What they require is proper time allocation or timetable. Moments in which time-pressure could be a deciding factor, such as acting fast to avoid a road accident (with the help of skilled hand or leg movements,) may well be the irregularities rather than the rule. Thus, though complex real-time situated cognition does involve constantly updating action-plans in response to quickly changing circumstances, it would be perhaps an over-stretch to attempt to scale up the principles we apply in controlling these, in order to make them form the regulating principles of our cognitive system as a whole (Wilson, 2002).

D. Assessing the Unloading of Cognitive Work onto the Environment

The argument that we unload cognitive work onto the environment is an important one. However, in order not to truncate its use as a cognitive strategy, we should rather move from concentrating on manipulation of spatial materials to emphasizing the sense in which these operations are not situated. Doing number with beads, as Yoruba pupils do, counting on one's fingers, and drawing diagrams are situated and spatial, involving the manipulation of spatial relations between items in our surroundings. Here, physical manipulation, instead of mental computation, spares us much cognitive labor. Such symbolic unloading must not be "deliberate and formalized," as the automaticity of gesturing shows. By helping to facilitate the speakers thought process, gesturing is said to serve cognitive purposes (Krauss, 1998).

Instances abound, though, where these behaviors are not strictly spatial and situated in the sense implied above. In these instances, these very behaviors are carried out to serve cognitive functions (outside of themselves) regarding things absent from our immediate surroundings. Again, an example of this could be doing number with beads, as Yoruba pupils do, where number-doing is no longer for the purpose of solving an immediate mathematical problem but for proffering solution to an imaginary problem that may or may not have future application. Another example is to use these resources to draw imaginary diagrams of how future Africans would be successfully giving birth on, rearing their children on, and living on trees, with a somewhat unique dexterity to perch up and down, an imaginary creation that may or may not have future application. In these moments, our cognitive system exploits external resources to arrive at solutions that may (or may not) be utilized at some subsequent period or place. When the goal of the action has no direct attachment to the situation any more, there might as well not be any attachment to spatial concerns. The behaviors could, then, be employed to represent abstract and non-spatial realms (Wilson, 2002). Exploiting bodily resources for cognitive goals in ways not directly attached to the situation is definitely of tremendous significance for cognition.

E. The Excesses of the View that the Environment is Part of the Cognitive System (critiquing its facultative character)

The view of a cognitive system distributed across the situation, implies a *facultative system*, which is temporary (in relation to its constitutive elements,) in that it is organized for a specific circumstance and is easily broken up. The constitutive elements come and go, within the life span of the system. Of course, the changes in functional relations, organization, bring along with them changes in the system's identity. This is understandable when we recall that organization defines systems. This view, however, distinguished itself from the traditional notion that propagates an obligate system, a system is single and permanent (during the life span of their parts,) being restricted to the cognitive processes of a single mind. The constitutive elements of the system retain their functional relations during their life span.

Wilson argues that the system's *openness to the environment*, receiving input and sending output, and the reciprocal influence these (receiving input and sending output) have on the system and on the environment, *does not alter the system's status as such*. He deems the facultative character of distributed cognition to be rather problematic, given that the purpose of science is not to elucidate particular events, but to identify fundamental "principles and regularities." He regards the distributed cognition notion as a rather strong one, and advocates a softer version of distribution of cognition. He calls for studying the mind and the situation on the one hand, and studying the mind as such on the hand.

F. Critiquing the Idea that Cognition has Direct Links to Action, Found in the Cognition-is-for-action Claim

Though the dorsal stream (the "how" system) of perceptual processing does seem to have evolved for action, the very existence of the ventral stream (the "what" system) does indicate that all encoding of information could hardly be specific-goal-oriented. The ventral stream (perhaps standing for representation for its own sake,) with its seeming pattern- identification tendency, somewhat complements the direct link to the motor system that the dorsal stream does seem to stand for. Consequently, alone, routes that process direct perception for action hardly explain perceptual encoding sufficiently. All too frequently, they miss out an important component of the phenomenon they are attempting to explain. The claim that cognition is for action, when taken in isolation, for all its indispensable contribution to embodied cognition, does seem to run this risk.

Doubtless, cognition is, in the final analysis, for action. Adaptive behaviors that promote survival must have propelled the development of our cognitive apparatus. However, it would be highly impoverishing to limit particular percepts, concepts, or memories to individual action patterns, by insisting on strict direct links between action and cognition. Perhaps a more enriching account could be that cognition all too frequently serves action through indirect and elastic action-patterns or tactics, where knowledge of patterns of interpreting the physical world are preserved for use in the future; a future-use that might be real, unforeseeable or imaginary.

G. Reasoning

The application of sensory-motor simulation not only to reason but also to solving daily problems is hardly surprising. Sensory-motor related mental models have been now and again shown to have an edge over merely abstract ones (Zwaan, 1999). This mode of conceptualization provides a simple link between what we say or do and they meanings they have for us. In image schemas we see a representation of the embodied knowledge of the material world. In constructing mental concepts from sensory-motor cognitive primitives, we see yet another aspect of embodied knowing. In using motor simulations to represent, imitate, predict, and understand the behaviors of our fellow humans, we see an additional aspect of embodied knowledge (Wilson, 2001).

To my mind, the view that off-line cognition is body based is the most balanced and most far-reaching of the embodied way of conceptualizing cognition. Though it is problematic accounting for concepts in relation to direct sensory motor patterns, Wilson (2002) observes that concepts could be constructed from sensory-motor cognitive primitives. Thus Barsalou's (1999) *Perceptual symbol systems* raise concepts from more rudimentary components that are at once modal and symbolic. These concepts are grounded in complex process that simulates relatively amalgamated physical and introspective events; these symbols remain, however, modal. Barsalou's perceptual symbols would have been wonderful if they were grounded in perception and yet left to be at least multi-modal (and by extension, sometimes, a-modal)

Lakoff and Johnson and some others take a rather different look at abstract concepts. We are inclined to agree with their approach. Their studies show that mental concepts are thoroughly metaphorical, modeled after the physical world and rest on analogies between abstract and more concrete domains (Lakoff & Johnson, 1980, Gibbs *et al.*, 1997). Our mental representation of the concept of communication, for instance, is rooted in our experience of how we transfer physical loads. Hence quite abstract mental concepts could be, similarly grounded in an indirect manner, in our knowledge of sensory and motor activities. Conceptual metaphors, they hold, is a cognitive framework revealing an experientially based framing from one realm of idealized cognitive model to another.

The immense range of mental simulation of the physical world and its events indicates how ubiquitous off-line embodied cognition could be. This could well be a reflection of the fact that it is a common principle underlying human cognition (Wilson, 2002, 635).

H. Differentiating Between On-line and Off-line Aspects of Embodied Cognition

(i) ***On-lineCognition***

The on-line aspect of this embodied manner of conceptualizing cognition comprises cognitive operations that are ingrained in task-relevant external situations. Among these are those that could entail time pressure and unloading cognitive tasks or data onto the environment. In this connection, the mind attends to the needs of a body engaged in a real-world circumstance. Much as the principles employed here are of tremendous merit, it would be inadequate attempting to scale them up as adequately explaining cognition.

(ii) ***Off-line Cognition***

Conversely, offline cognition consists of cognitive operation where sensory and motor functions are employed in cognitive works whose referents are of distant space and time or are completely imaginary. These comprise symbolic unloading, in which external resources are employed to help mental representation and manipulation of absent objects, in addition to downright internal application of sensory-motor representations, as in mental simulations. In this regard, the body attends to the exigencies of the mind, rather than the mind being subservient to the body, as in on-line embodied cognition. As Wilson (2202) points out, it this getting-the-upper-hand by the mind and the attendant power to mentally represent that which is distant in space and time, that could have constituted the spring board of that specifically human intelligence that parted us from the early humans.

I. Conceptual Versus Perceptual System?

The conventional theoretical framework restricts cognition essentially to the brain and its manipulation of abstract symbols, in a rule-based fashion. When we get perceptual input, we fashion it into the appropriate abstract conceptual language of thinking, we then subject it to some rule-based manipulation for processing, and eventually motor output ensues. It is a strictly propositional conceptual system that refuses perceptual phenomena any meaningful place.

This view of the human brain had been influenced by advancements in digital computer. Artificial intelligence -- by means of its accent on input-output models, computation via symbol manipulation, serial processing, and so on -- affected human thought in no small measure. In computers the decisive role was that of the CPU (central processing unit). With input and output playing second feeble, Artificial intelligence (AI) concentrated on getting suitable internal representations for modeling and manipulating the necessary symbols. In cognitive science, cognition became computation. It modeled human knowledge after propositional representations; and reason, after rule-based symbol manipulation. For the most part, formal logic held sway for this disembodied view, which translated the logic of computers into the logic of human mind. On the whole, concepts in this mode of conceptualization remained to date neatly and explicitly defined entities that are manipulated via a number of explicit rules.

Conversely, embodied way of conceptualizing cognition incorporates the interactions of the body with the world into cognitive activity. Cognitive activity stretches beyond the brain into the body's interaction with the world, which constitutes its social and material environment. The sensory-motor and cognition belong together, it is held. The environment, physical and social, motivates cognition and is part of most of cognitive function. Representations inside the brain have constant and dynamic relations with representations outside the brain. Representations are all too frequently external rather than internal; for, wanting to save time and energy needed for translating information into extra abstract forms for processing, representations assume the highest possible external forms. Often, representations are left out of the body completely, and are pushed out into the world. All this, it is argued, seem to indicate that sensory motor processing is more effective than the highly conceptual. Hence, cognitive activity cannot be, by and large, separated from real-world interaction, which includes the body, the perceptual system, and the environmental context.

External representations, it is held, are only seconded by the direct manipulation of internal perceptual traces that do not need translation to higher conceptual form. Conceptual symbols are linked to the perceptual traces they stand for as patterns of embodied experience, instead of arbitrarily. In the same way as the initial perceptual traces of the conceptual symbols were active in the perceptual brain regions, so also are the conceptual symbols themselves active in those perceptual brain regions.

Embodied cognition highlights *dynamics* too. Real-time behavior could not but be part of cognition. Embodied cognizers have to deal with the physical limitations of responding to signals, as well attempting to synchronize internal and external events. *Emergence* is also stressed. Phenomena are said to emerge from certain dynamic systems of interaction, which some in the embodied cognition attempt to pinpoint (See Verran). Put together, reason for the embodied viewpoint is imagistic (image-like), dynamic, and analogistic (analogy-dependent), rather than the product of mere logical symbol manipulation.

So we have in our hands two seemingly competing systems. One is, as it were, conceptual, propositional, computer-like serial processing, non-perceptual (i.e., abstract,) rule-based symbol manipulation. The other is, so to say, perceptual, often modal, involving external representation (taking representations outside the brain, taking representation out from the body into the world).

Added to these is what has already been variously indicated in the course of this paper that whether memory is really compartmentalized may still be a matter of theoretical conjectures. Given the apparent absence of consensus here it could be that Each of the two seemingly competing systems has of course its merit. There is hardly any doubt that the sensory-motor functions constitute the basis of the mind's operations, perhaps because the brain evolved to control the body, as is often held. In addition, the human experience of manipulating mental images, makes one feel strongly that pictures, for example, form a certain platform for higher thought. Inversely, abstract concepts, such as justice, seem to be rather better represented in an abstract conceptual framework. Although Johnson (1987) has shown quite convincingly how balance could be metaphorically represented.

The need for an embodied system of thought can hardly be over emphasized. Ever since psychologists began noticing that slight variations in controlled laboratory experiments altered results significantly, there has been mounting evidence for the context-dependent nature of even the most robust of human behaviors. This awareness was further heightened by findings that humans exploited structures in their surroundings to unload internal cognitive job-load.

Again, it was getting increasingly evident in artificial intelligence (AI) that supposedly difficult mental assignments were proving to be easy for humans, probably, because these belonged to the elementary abilities of the early man. Likewise, there was growing understanding that the creations of classical AI representations could not stand the unpredictability of the real world environment.

Philosophers, for their part, began pointing out the apparent folly of an all-out symbol-manipulation-system, where symbols received their meaning only in relation to *other symbols*. If it were so, they queried, from where did those *other symbols* receive their meaning.

Mark Johnson, thus, proposes a system of image schemas that is a-modal and yet basically percept-like. He sees meaning as rooted in perception and action, and holds that we had better let the conceptual system function in this sphere of meaning instead of attempting to attach meaning to we are yet to have the final word on the matter; despite loud claims about (and probably some inroads into the possibility of) the existence of specialized memory units (localization). Meanwhile Edelman and others have made a strong case against the entire prospect of localization.

it by making it have some association to a rather "distinct system". Johnson believes that the ubiquitous use of metaphor in language is a pointer to the nature of our conceptual system, revealing the analogy-driven nature of concepts. Concepts are context-dependent rather than objective; and words have their meaning in the way we use them in describing our world. Thought derives from bodily experience through a network of non-propositional schematic structures, namely, image schemas. Image schemata are continuous, active, dynamic, and recurring structures that organize our experience and comprehension. They constitute for us dynamic patterns, structures, according to which we organize our experience and understanding as we move and perceive with our bodies. Images and mental pictures have a certain particularity and specificity about them, while image schemata have an aura of generality. They have neither the richness of images nor are they as abstract as propositions.

A good example of the image schematic structure could be the recurring pattern one finds in the experience of balance. The example Johnsoncites is that of a toddler attempting to walk for the very first time. One notices her initial unsteady ventures into distributing 'mass and force' proportionately around some imaginary vertical axis. One observes her stretching out her arms to set up a somewhat steadying and stabilizing horizontal axis, proportional to the vertical axis. This imaginary central axis, about which the toddler distributes the forces, is neither a physical or perceptible object, nor a propositional structure conceptualized by the baby, nor a certain conceptual rule that she possesses, nor an image that she has. It is, instead, a "recurrent pattern in the experience of balancing" (Johnson, 1987, 76).

In contrast to Barsalou's *perceptual symbol systems,* Johnson's image schematic structures can be multi-modal or a-modal, and yet not be non-perceptual. This is the strength of Johnson, I would say. Kosslyn (1976) is one more example of off-line perceptual activity. He and his associates are strong advocates of "mental imagery". They call attention to the conscious experience we have of somewhat complete, percept-like traces, without the presence of parallel external stimuli. Kosslyn refuses, however, to affirm that picture processing alone could be foundational to all of our conceptual functioning. He would, rather, have a somewhat dual system, where image-components would interact with the conventional propositional system. The modalities for such a dual system, though, is yet to be worked out.

Surely, the human experience of manipulating mental images makes one feel strongly that mental imagery forms a certain platform for higher thought. However, Kosslyn's mental images seem rather a lot percept-like, for one's liking. In contradistinction to Kosslyn, Barsalou's perceptual symbols, though *bound up in* specific perceptual systems, are abstracted via filtering processes, avoiding being on a par with conscious perceptual experiences. In this sense, Barsalou and his colleagues do have an edge over Kosslyn. But then, Johnson's image schemata seem to be the most abstract of the three; and given that we are looking for a way of conceptualizing cognition that is perceptual and yet "highly" abstract, Johnson does seem to have an edge over them all.

Barsalou, Kosslyn, and Johnson, all agree on perceptual representation. Each is an instance of a concept-like processing in a perception-based system of thought. This definitely underlines the place of perceptual components in conceptual thought. The handicap of Barsalou and his colleagues, though, is how to explain that one rule is redundantly stored in both our auditory and visual systems. Their unflinching demand that all content be put within specific modalities implies that the concept of balance would be differentially represented for each. Johnson negotiates his way out of this comparatively restrictive and unnecessary burden, by acknowledging a-modal and multi-modal, yet percept-like, conceptual contents.

Johnson's acknowledgment of a-modal conceptual contents, capacitates percept-like representations (image schemata, for instance) to cross modalities and take part in some analogy-related associations, and yet retain the benefits of keeping representations near enough to the sensory-motor domain. This, to my mind is the merit of Johnson. Add that too to the imaginative structures of thought, where in their conceptual metaphorical functions and their conceptual metonymic operations, the imaginative aspects of our mind enable us comprehend spheres of experience beyond the immediate, transcending the mirroring and literal representation of the external world, taking the human mind beyond its immediate feeling and sphere, and providing the occasion for abstract reasoning , as well as enabling human categorization take place in a manner that avoids literarily mirroring the realities of the external world, while retaining the imaginative imprints of these processes. Thus, as we employ our imaginative faculties and processes in contemplating and talking about our experiences, the conceptual metonymic models of imaginative thought serve a *referential function* and yield reference-point reasoning, while the conceptual metaphoric models essentially do the function of *assisting in understanding*.

Conclusion

A single current does seem to run through our entire study, ranging from the survey research of Tourangeau and his associates and their cognitive approach to survey errors (with the whole range of context effects they identify,) to Schwarz and his comparisons across cultures and age-groups, over to Edelman and his neuronal group selection, to Barsalou and his colleagues and their army of embodiment effects. Admitting this would be hard to resist. Memory is evidently fragmentary and context-dependent, as the entire swam of context effects indicates. Cognition, it does seem, (in both its on-line and off-line dimensions) could not but be embodied, as the immense range of embodiment effects suggest. It is also imaginatively structured, as the conceptual metaphoric models and, in a special way, the imaginative models of conceptual metonymy reveal. We, therefore, need a way of conceptualizing cognition and, by extension, human reasoning and problem solving, that would be true to both the perceptual and conceptual components of thought. Johnson's image schematic structures and his imaginative processes, where imagination provides the connection between bodily and cognitive structures, could be one such possibility, at least for a start. Thus the activities of our imaginative faculty would link conceptual structure and function, answering the question of how mental representation receives meaning.

All this goes together with a biological understanding of man with a twofold reading of evolution. The first is a certain reading of Darwin, where variance in populations is of the essence andthe diversity that emanates from it is not a noisy diversion and a threat, but a sequence of life and strength, an idea taken up by Edelman and identified as the root of change in his theory of neuronal group selection. The second is the understanding of evolution as neural categorization where, grounded in developments in perceptual functions and motor skills found in lower animals**,** man has evolved todo neural categorization as the outgrowth of his biological constitution instead of the product of any conscious reasoning.

References

Beer, R. D. (2000). Dynamic Approaches to Cognitive Science. *Trends in Cognitive Sciences*, 4, 91-99.

Brooks, R.A. (1991b). New Approaches to Robotics. *Science*, 253, 1227-1232.

Craighero, L., Fadiga, L., Umilta, C.A., & Rizzolatti, G. (1996). Evidence for Visuomotor Priming Effect. *Neuroreport*, 8, 347-349.

Fadiga, L. & Craighero, L. (2003) New Insights on Sensorimoror Integration: From Hand Action to Speech Perception. *Brain and Cognition*, 53, 514-524

Fadiga, L., Craighero, L., and Olivier, E. (2005) Human Motor Cortex Excitability During the Perception of Other's Action. *Current Opinion in Neurobiology*, 15, 213-218.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Boston: Houghton-Mifflin.

Glenberg, A.M. (1997). What Memory Is For. *Behavioral & Brain Sciences*, 20 (1), 1-55.

Glenberg, A.M. & Robertson, D.A. (1999). Symbol Grounding and Meaning: A Comparison of High-Dimensional and Embodied Theories of Meaning. *Journal of Memory and Languages*, 37, 141-154.

Goodale, M.A. & Milner, A. D. (1992) Separate Visual Pathways for Perception and Action. *Trends in Neurosciences*, 15, 20-25.

Johnson, M. (1987) *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press

Johnston, W. A., Dark, V.J., & Jacoby, L.L. (1985). Perceptual Fluency and Recognition Judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 11, 3-11

Krauss, R.M. (1998). Why Do we Gesture When We Speak? *Current Directions in Psychological Science*, 7, 54-60

Kosslyn, S.M., Pascual-Leone, A., Felician, O., Camposano, S., Keenan, J.P., Thompson, W.L., Ganis, G., Sukel, K.E., and Alpert, N.M. (1999). The Role of Area 17 in Visual Imagery: Convergent Evidence from PET and TMS. *Science*, 284, 167-170.

Lakoff, G. & Johnson, M. (1999). *Philosophy in the Flesh. The Embodied Mind and its Challenge to Western Thought*. New York: Basic Books.

Parsons, L.M.,Fox, P.T., Downs, J.H. ,Glass,T., Hirsch,TB(1995). Use of Implicit Motor Imagery for Visual Shape Discrimination as Revealed by PET. *Nature*, 375, 54-58.

Thelen, E. & Smith, L.B. (1994). *A Dynamic Systems Approach to the Development of Cognition and Action.* Cambridge, MA: MIT Press.

Wilson, M. (2002). Six Views of Embodied Cognition. *Psychological Bulletin & Review*, 9 (4), 625-636.

Wilson, M. & Emmorey, K. (1997). A Visuospatial "Phonological Loop" in Working Memory: Evidence from American Sign Language. *Memory & Cognition*, 25, 313-320.

Zwaan, R.A. (1999). Embodied Cognition, Perceptual Symbols, and Situated Models. *Discourse Processes*, 28, 81-88