Reclaiming Cognition

The Primacy of Action, Intention and Emotion

edited by

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Could the Future Taste Purple?

Reclaiming Mind, Body and Cognition

This article examines the primacy of real-world bodily experience for understanding the human mind. I defend the idea that the peculiarities of the living human brain and body, and the bodily experiences they sustain, are essential ingredients of human sense-making and conceptual systems. Conceptual systems are created, brought forth, understood and sustained, through very specific cognitive mechanisms ultimately grounded in bodily experience. They don’t have a transcendental abstract logic independent of the species-specific bodily features.

To defend this position, I focus on a case study: the fundamental concept of time flow. Using tools of cognitive linguistics, I analyze the foundations of this concept, as it is manifested naturally in everyday language. I show that there is a precise conceptual metaphor (mapping) whose inferential structure gives an account of a huge variety of linguistic expressions, semantic contents, and unconscious spontaneous gestures: Time Events Are Things In Space. I discuss various special cases of this conceptual metaphor. This mapping grounds its source domain (space) in specific spatial bodily experiences and projects its inferential structure onto a target domain (time) making inferences in that domain possible. This mechanism allows us to unconsciously, effortlessly, and precisely understand (and make inferences with) expressions such as ‘the year 2000 is approaching’ or ‘the days ahead of us’. The general form of the mapping seems to be universal. The analysis raises important issues which demand a deeper and richer understanding of cognition and the mind: a view that sees the mind as fully embodied. In order to avoid misunderstandings with a general (and somewhat vague) notion of ‘embodiment’ which has become fashionable in contemporary cognitive science, I describe what I mean by ‘full embodiment’: an embodied-oriented approach that has an explicit commitment to all of cognition, not just to low-level aspects of cognition such as sensory-motor activity or locomotion (lower levels of embodiment). I take embodiment to be a living phenomenon in which the primacy of bodily grounded experience (e.g., motion, intention, emotion) is inherently part of the very subject matter of the study of the mind.

The Colleague Who Had a Question For You...

Let’s say that you are a scientist. Your subject matter is the study of the mind, the human mind. More specifically, you study conceptual systems and how humans make basic effortless inferences in everyday life. One day a colleague comes in and tells you that she went out and did a field study. She observed people in everyday life...

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conversations, talking, making gestures, making jokes. She also observed TV commercials, scientists giving talks, and priests celebrating ceremonies, and studied how ideas are expressed in printed material such as technical books, newspapers, holy texts, and commercial advertisements. Among many things, your colleague observed that no matter what the field, and irrespective of whether it was oral or written English, people use expressions such as:

Faster than ever we are approaching the end of the millennium; he finally left his sad past behind; the winter hasn’t arrived yet; he is organizing a retrospective of Hitchcock’s movies; the days ahead of us are promising; the concert took place the day before yesterday; Christmas is gone; it started all the way back in the thirties; the millennium bug will bother us well beyond the year 2000; so far we have been lucky. And so on.

Your colleague points out to you that these expressions, although making use of completely different words, being about different subjects, and being observed in different contexts, do have something in common: they all serve to express ideas about time in terms of objects, positions and movements in space (see Figure 1). What is interesting, your colleague adds, is that people seemed to use these expressions in an absolutely natural way, with no effort, and without even being aware of the fact that they were talking (or reading) about time events in terms of objects in space. Listeners engaged in conversations seemed to follow what was said in an equally natural effortless manner. Moreover, and interestingly enough, people seemed to make quick, precise, and effortless inferences when expressions like those were made. People immediately understood that the days ahead referred to days in the future; that those days have not occurred yet; that those days will occur earlier than days that are even further ahead, and so on. People never seemed to be puzzled or confused with expressions such as ‘we are approaching the end of the millennium’. Somehow, they implicitly understood that approaching implies that the given time (the end of the millennium) is a moment that has not occurred yet, and that it may occur sometime relatively soon. Completely intrigued with these observations, your colleague asks you a very direct and simple question: How is it that human beings understand so effortlessly and unconsciously ideas, experiences, and inferences about time, while talking about space? How can that be?

So, here you are — you the scientist — someone who is trying to understand the human mind, the conceptual systems, and the inferential mechanisms that human animals take for granted and that make the most basic details of our everyday life so unbelievably livable . . . to the point that we don’t even notice them! So, what do you say?

**Serious Business**

My point with this little story is to make clear that these questions — although they may seem at first trivial and anecdotal — are far from being obvious, and that they should be taken very seriously in the various fields of cognitive science[1] and the study of the mind. In fact, there are more interesting details that make these observations extremely relevant. When producing speech, people usually generate an impressive amount of spontaneous gestures, bodily postures, and facial expressions. More precisely, people produce — in a perfectly synchronized manner — spontaneous gestures which somehow match the meaning, timing, and form of the oral expressions used (McNeill, 1992; Iverson and Thelen, 1999). For instance, with a hand or a finger, people point towards something in their backs at the very moment when they say ‘all the way back in the thirties’. Or they show something in front of them when saying ‘the days ahead of us’. Therefore, bodily actions (i.e., spontaneous gestures) and speech, not only are coherent, but occur with an impressive synchronicity with speech. But there is more. In everyday conversations, people make the most amazing inferences in a matter of milliseconds. For example, consider the following questions.

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[1] By cognitive science, I simply mean the scientific study of cognition in a large sense (i.e., including various aspects of the mind). That is, it is the study of a particular subject matter — cognition (and the mind) — through the explicit use of the scientific methodology. From this perspective, nothing says that cognitive science is or should be about computation, or that it necessarily makes use of computer technology and computer-based concepts in studying the subject matter.
What does it mean to say that "Christmas is gone"? After all, Christmas is a social (and commercial) event. As such, it does not move anywhere. So, gone where? In what space did it move? From where to where? Going through what locations? Similarly, if two people are sitting in a pub drinking beer, why should they say 'faster than ever we are approaching the end of the millennium', if they are just there, simply sitting, statically, drinking beer? How can they approach anything at all — much less a 'moment' such as 'the end of the millennium'? From where are they approaching it? Faster than what? How is it that people simply go about in their everyday conversations deeply understanding all these expressions, with no effort at all, often not even being aware of them, and what is more, making quite sophisticated inferences about the structure of temporal experiences?

Towards reclaiming cognition

In the following pages, I will analyse this intriguing phenomenon of human everyday conversations. Through the analysis of this time–space case study, I will try to give support to the main goal of the present volume. That is, to show that the scientific study of the mind needs to reconsider its very subject matter in a broader, deeper, and richer manner. I will argue that the questions above can be answered only in a limited manner from the perspective provided by traditional mainstream cognitive science. That is, when one approaches these questions with a dualistic and functionalistic view of cognition, where one sees cognition as a purely abstract rule-driven information-processing phenomenon, inherently separated from the nature of the body of the living human animal, and the bodily experiences it sustains (Freeman & Núñez, this volume). Through the time–space case study, I will defend the idea that cognition — and the study of the mind — needs to be reconsidered. It needs to be redefined, reclaimed in order to be understood in a more appropriate way than has been done by mainstream cognitive science and its various computer-metaphors for the mind.

In the rest of the article, I intend to accomplish several things. First, I will analyse the above time–space case through current work done in the emerging field of cognitive linguistics, focussing on the understanding of the notion of time flow. Second, this analysis will raise important issues which, I will argue, demand a deeper and richer understanding of cognition and the mind: a view that sees the mind as fully embodied. Third, I shall describe what I mean by (full) embodiment, and avoid misunderstandings with a general (and somewhat overused) notion of 'embodiment' which has become fashionable in contemporary cognitive science. I will take embodiment to be a living phenomenon in which the primacy of bodily grounded experience is inherently part of the very subject matter of the study of the mind. Finally, I will close defending the idea that in order to meet the foundational demands imposed by this view, we need to free ourselves from several taken-for-granted harmful dogmas that impede a clear understanding of important mental phenomena, and which have been at the core of much of mainstream cognitive science and philosophy of mind.

How do we Conceptualize Time Events? A View from Cognitive Linguistics

In recent years, the emerging field of cognitive linguistics has made some interesting contributions. Among others, it has confirmed that an important amount of abstract thought is unconscious (i.e., it happens below the level of awareness and therefore is often beyond introspection), and it has shown that concepts are systematically organized through everyday cognitive mechanisms such as conceptual mappings. The most well known conceptual mappings are conceptual metaphors (Lakoff and Johnson, 1980; see Lakoff, 1993, for a general overview) and conceptual blends (Turner and Fauconnier, 1995; Fauconnier, 1997; Fauconnier and Turner, 1998). For the purpose of our case study, I will focus only on the first one.

A conceptual metaphor is a cognitive mechanism that allows us to make precise inferences in one domain of experience (target domain) based on the inferences that hold in another domain (source domain). Through this mechanism, the target domain is understood, often unconsciously, in terms of the inferential structure that holds in the source domain. One shouldn't get the idea that 'metaphor' here is a mere figure of speech used by poets or politicians to illustrate an idea for aesthetic or manipulative purposes (respectively). In fact, a conceptual metaphor, as understood in cognitive linguistics, does not belong to the realm of words but to the realm of thought. And this is very important to keep in mind: a conceptual metaphor is a cognitive mechanism, an inference-preserving cross-domain mapping.

A key concept in this theory is that the 'projections' from source to target domain are not arbitrary, and that they can be studied empirically and stated precisely. They are not arbitrary, because they are motivated (in general) by our bodily grounded experience, which is biologically constrained. For example, underlying expressions like 'She greeted me warmly' or 'send her warm hellos', there is a conceptual metaphor which allows us to conceptualize Affection in terms of bodily grounded thermal experiences: Warmth. This mapping is not a mere arbitrary social convention. It is based on a (human) invariant, which is the shared experience of the correlation between the bodily sensation of warmth and affection from the most early days of our ontogeny.

Research in contemporary conceptual metaphor theory has shown that there is an extensive conventional system of conceptual metaphors in every human conceptual system. The empirical evidence comes from a variety of sources, including, among others, psycholinguistic experiments (Gibbs, 1994), generalizations over inference patterns (Lakoff, 1987), historical semantic change (Sweezer, 1990), and the study of spontaneous gestures (McNeill, 1992). When combined in an appropriate way, these conceptual mappings sustain even the most sophisticated forms of abstract thinking, such as the conceptual apparatus underlying the whole edifice of mathematics (Lakoff and Núñez, 1997; 2000; Núñez and Lakoff, 1998).

Among the hundreds of conceptual metaphors that have been studied in depth in the last decade, there is the one concerning our understanding of time in terms of motion in space, originally described as the Time Passing Is Motion metaphor (Lakoff, 1993). Today we know that there are different forms of this mapping. Particularly relevant is the distinction between time-based metaphors and ego-based metaphors. Both of them are present in our everyday language, but they work in rather different manners. The reason why they are called time- and ego-based is because the former works in terms of a metaphorical "orientation" applied to events

[2] Following a convention in Cognitive Linguistics, capitalise here serve to denote the name of the conceptual mappings as such (e.g., Time Passing Is Motion). Particular instances of mappings, called metaphorical expressions (e.g., 'summer is approaching'), are not written with capitals.
RECLAIMING MIND, BODY AND COGNITION

This time-based conceptual metaphor accounts for a variety of linguistic expressions (and their semantic entailments) such as,

In the preceding session...; in the days following next Wednesday...; the day before yesterday...; Greenwich Mean Time is lagging behind the scientific standard.

2. Ego-based metaphor

This is a relatively complex conceptual metaphor which has two layers of encompassing inferential structure: a basic static one and a dynamic one. The complete dynamic mapping, in turn, manifests itself in two distinct forms depending on the nature of the moving entity. The basic (non-dynamic structure) is the following.

Ego-based metaphor: Basic static structure

**Nature:** Time is understood in terms of things (entities and locations) in space.

**Background conditions:**
- There is a landscape, and a canonical observer.

**Mapping (basic static structure):**

<table>
<thead>
<tr>
<th>SOURCE DOMAIN</th>
<th>TARGET DOMAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Things</td>
<td>Times</td>
</tr>
<tr>
<td>Sequence of objects</td>
<td>Chronological order of times</td>
</tr>
<tr>
<td>Horizontal movement of the entire sequence in one direction</td>
<td>Passing of time</td>
</tr>
<tr>
<td>Things oriented with their fronts in their direction of motion</td>
<td>Times oriented with their fronts in their direction of motion</td>
</tr>
<tr>
<td>An object A in front (behind) of an object B in the sequence</td>
<td>A time A occurs earlier (later) than a time B</td>
</tr>
</tbody>
</table>

**Entailments:**
- If time B follows time A (in the sequence), then time B occurs later than time A (it is in the future relative to time A).
- Transitivity properties applying to relative positions in the sequence in the source domain are preserved by the mapping so they are available in the target domain. For example, if event C is behind (in the future relative to) an event B, and event B is behind (in the future relative to) A, then event C is behind (in the future relative to) event A.
- Since the sequence of objects is one-dimensional, time is one-dimensional.

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The term ‘ego’ here is used in the sense found in the technical literature in linguistics (see, for example, Ducatel, 1983). This shouldn’t be confused with the term ‘ego’ commonly used in psychology which designates a complex and dynamic integrative apparatus relating with the notion of self.

Notice that in the source domain, ‘front’ is already a metaphorical front brought in from another conceptual mapping. A mapping that allows us to ascribe an orientation to objects relative to their normal direction of motion (as in the front of the car). Furthermore, the same mechanism allows us to ascribe a metaphorical orientation to objects which don’t have inherent orientation, such as a cube: We can unmistakably conceptualize the ‘front’ side of a cube sliding along a flat surface.
**Background conditions:**
- There is a landscape, and a canonical observer which may move.
- The observer and the thing(s) in the landscape don’t move simultaneously.
- When one entity is moving (thing or observer), the other is stationary; the stationary entity is the deictic centre.

**Mapping (additional dynamic structure):**

<table>
<thead>
<tr>
<th>SOURCE DOMAIN</th>
<th>TARGET DOMAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Uni-dimensional Space</td>
<td>Time</td>
</tr>
<tr>
<td>Relative motion (of the things with respect to the observer) along a one-dimensional landscape</td>
<td>→ The passing of time</td>
</tr>
</tbody>
</table>

**Entailments:**
- Since motion is continuous and one-dimensional, the passage of time is continuous and one-dimensional.

When (relative) movement is incorporated into the general mapping, new precise inferential properties emerge. As indicated above, one of the background conditions of this conceptual mapping establishes that the canonical observer and the thing(s) in the landscape don’t move simultaneously. Either the observer moves while things are stationary, or things move while the observer is static. These two possibilities sustain two specific forms of the more general conceptual mappings observed in everyday language. These special forms are the following:

**2.1. Dynamic ego-based form 1: Time Passing Is Motion Of An Object**
In this case, the observer is fixed and the times are entities moving with respect to the observer. These elements bring additional inferential structure to the general mapping.

<table>
<thead>
<tr>
<th>SOURCE DOMAIN</th>
<th>TARGET DOMAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Uni-dimensional Space</td>
<td>Time</td>
</tr>
<tr>
<td>Things moving horizontally with respect to the fixed observer (and with their fronts in their direction of motion)</td>
<td>→ Times</td>
</tr>
</tbody>
</table>

**Entailments:**
- The time passing the observer is the present time.
- Time has a velocity relative to the observer.
- If time B follows time A (in the movement towards the observer, or away from him/her), then time B occurs later than time A (time B is in the future relative to time A).

This form of the conceptual metaphor accounts for the linguistic form and the semantic entailments of expressions like:

**2.2. Dynamic ego-based form 2: Time Passing Is Motion Over A Landscape**
In this case, times are fixed locations and the observer moves with respect to time.

<table>
<thead>
<tr>
<th>SOURCE DOMAIN</th>
<th>TARGET DOMAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Uni-dimensional Space</td>
<td>Time</td>
</tr>
<tr>
<td>Fixed objects (or locations) with respect to which the observer moves</td>
<td>→ Times</td>
</tr>
</tbody>
</table>

**Entailments:**
- Time has an extension, and can be measured.
- An extended time, like a spatial area, may be conceived of as a bounded region.

This form of the mapping accounts for another family of expressions:

> We are getting closer to the end of the summer. Fortunately, we left that horrible story behind us; I will walk towards the future with optimism. He passed the time happily. We are approaching the year 2000. We are arriving at the end of the millennium.

The two forms of the ego-based metaphor have a quite different inferential structure. In fact, as Lakoff points out (1993), they are sometimes inconsistent with one another: the same words used in both special forms have inconsistent readings. For instance, the approaching of ‘The end of the world is approaching’ (Form 1), and ‘We are approaching the year 2000’ (Form 2) take different arguments. Both refer to temporal events, but the former takes a moving time as a first argument and the latter takes a moving observer as a first argument. The same holds for arrive in ‘the time has arrived’, and ‘We are arriving at the end of the millennium’. But despite these differences, there is an important entailment that is shared by both forms.

**Entailment common to both Dynamic Ego-based forms:**
- If Time A approaches the observer (Form 1) or if the observer approaches Time A (Form 2), the metaphorical distance between Time A and the observer:
  - gets shorter as the action ‘approaching’ takes place, and
  - will be shorter after the action ‘approaching’ is over.

It is very important to keep in mind that this entailment does hold for both forms of the general dynamic mapping, but it is not what is empirically observed. In everyday conversations, we don’t normally use expressions such as ‘Christmas and ourselves are approaching each other’. It is simply an empirical fact, that these kinds of expressions are not observed. Therefore, from a cognitive perspective, it would be a mistake to consider the two forms of the ego-based metaphor as ‘models’ of a unique abstract truth about the distance between the observer and a specific time. As a scientist, one should focus on what one does observe empirically, that is, expressions involving time which are accounted for either by Form 1 or by Form 2 of the conceptual metaphor. It is this observation that can tell us about the basis of how the mind works, not
an *a posteriori* logical analysis of reason. This point is crucial. Ignoring it simply impedes us in understanding why and how reason is bodily grounded.

**We, the experts**

One of the most striking things about everyday conversations is that we seem to be absolute experts in mastering the subtleties involved in the network of conceptual mappings. For instance, in what concerns our example, we use the different forms of the general mapping *Time Events Are Things In Space*, unconsciously ‘knowing’ when and how to operate in the appropriate sub-mappings, and drawing the appropriate inferences. Not only do we often do it unconsciously, but also we do it effortlessly, and with an astonishing speed and accuracy. Consider, for instance, the following two expressions in Spanish (in which language the above mappings also occur):

1) El estudiará lo que acontecieron con *posterioresidad* a 1988.

2) El estudiará lo que aconteció desde 1988 en adelante.

Expression (1) means ‘he will study what happened after 1988 *(posterior to)*’, and expression (2) means ‘he will study what happened from 1988 on *(fromward)*’. Both expressions mean the same,⁵ that is, that ‘he will study what happened in the years following 1988’: they refer to the years in the future relative to 1988. But notice that expression (2) refers to *adelante* *(front)*, and expression (1) refers to *posterior* **(back, rear)**. So how come we metaphorically mean the same thing using expressions which are referring to opposite orientations such as front and back? This sounds quite paradoxical indeed. But in fact, if we look closely at the underlying conceptual mappings, it is not. Expression (1) is based on the time-based mapping described above, whereas expression (2) is based on the ego-based mapping. The *posterior* **(back, rear)** of expression (1) applies to the *back of* 1988 as a particular metaphorical object (a year-thing) characterized by the background conditions of the time-based mapping. And the *adelante* **(front)** of expression (2) applies to the front relative to the bodily orientation of the observer characterized by the background conditions of the ego-based mapping. As we saw, these two conceptual mappings are very different, but sometimes the extensionality of the cases holding their entailments may coincide, resulting in expressions which mean the same while making reference to opposite orientations! However, we seem to be experts at keeping our mappings straight, so we don’t make mistakes, and we don’t have troubles maintaining conversations. In fact, it is really amazing that in our everyday conversations, these things don’t seem paradoxical at all. We are (unconsciously) simply wonderful experts at operating in different mappings at once, and at making inferences within the exact appropriate mapping. And we are experts at dealing with these sophisticated situations under extremely demanding real-time and real-world constraints. The naturalness and speed at which we master these cognitive mechanisms is often striking, and go beyond pure speech or written language. Consider the following example in French:

\[\text{Pierre: Notre grand-mère est née en 1930, n'est-ce pas? (Our grandmother was born in 1930, right?)}\]

\[\text{Natalie: Non! Elle est née bien avant! (No! She was born way before!). (And at the very same time, Natalie makes a gesture quickly moving her hand towards her back, with the palm facing backwards.)}\]

Here Natalie says *'avant'* (meaning before, front), and her gesture indicates *backward*. This may be seen as a contradiction between gesture and speech, a ‘contradiction’ which, as speakers, we are not aware of (unlike when somebody says to us ‘go left’, while indicating to the right, which usually does bother us and we immediately become aware of). But there is no such thing here. What happens is that the oral expression makes use of the time-based metaphor in which the time when grandmother was born has occurred much earlier (in front, according to that mapping) than the time Pierre had in mind. And the gesture makes use of the sequence defined by the time-based metaphor, but oriented in the precise direction required by the source domain of the ego-based metaphor, that is, a sequence with their metaphorical fronts facing the observer. The result is that the time when the grandmother was born is *in front* (earlier) of the time suggested by Pierre *avant*, meaning before) in the time-based metaphor, but also that that time has passed already and it is *behind* the observer in the ego-based metaphor. As active sense-makers, we seem to use basic everyday cognitive mechanisms to sustain these very sophisticated inference patterns in a precise, fast, and unambiguous manner.

**Learning From the Case Study: The Primacy of the Living Body**

Now, let’s step back for a moment, and reflect on what we have analysed so far. What we have done is to characterize just one among the thousands of conceptual mappings we use — often simultaneously, and combined in complex ways — in everyday conversations. We analysed a system of conceptual metaphors — the general mapping *Time Events Are Things In Space*. This mapping characterizes the conceptual structure that sustains the fundamental idea of time events and time flow, giving an account of hundreds of everyday linguistic expressions (like those listed above) and their semantic entailments. Because of its fundamental nature, this mapping provides some interesting insight into the nature of the human mind and human conceptual systems. Two aspects are especially relevant for this article: the universality of the use of unidimensional space as source domain of the mapping, and the primacy of the inherent bodily orientation.

**Universality of space as a source domain of the mapping**

What can we say about the universality of the basic mapping *Time Events Are Things In Space*? Do we find it in other languages and cultures as well? We now know that both conceptual metaphors for time and space — time-based and ego-based — have been observed not just in English, Spanish, or French, but also in many Indo-European languages, and even in non-Indo-European ones such as Chinese, Japanese, Korean, some African languages like Wolof in Senegal, and Hebrew, to name a few (Sweetser, 1999; Moore, 1999). These observations provide huge evidence in favour of the idea that the general mapping *Time Events Are Things In Space* is indeed a human universal. Of course, there are some details which may vary from

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⁵ In order to be precise, I should say that expression (2) may include the year 1988 in the period, whereas expression (1) leaves that year out. However, for the purpose of what I want to illustrate, that is not relevant. What matters here is that both expressions refer to years in the future relative to 1988.
culture to culture, and from language to language. For example, some languages may focus on dynamic aspects and others on static and positional aspects. Or some languages may differ in when they use Form 1 or Form 2 of the ego-based metaphor, and so on.

Sometimes the variation of the details of the mappings is in fact quite striking. For the last few years — in collaboration with some colleagues of Northern Chile — I have studied the structure of the general mapping Time Events Are Things In Space in native speakers of Aymara, an Amerindian language spoken in the highlands of the Andes mountains. We have found that besides a perfectly common time-based mapping, they use a form of the ego-based mapping which maps the front with the past, not with the future! We have observed this not only in purely linguistic expressions, but also in the manifestation of spontaneous gestures. For instance, when saying something like ‘long time ago’ they point towards the front of them. And when referring to some event that occurred even earlier than that, they point even further ahead (thus exhibiting the transitivity properties described earlier). The details of how this works in Aymara, how this situation is explained in bodily-grounded terms, and how all this relates to the Aymara culture are quite interesting, but go beyond the scope of this paper (see Núñez et al., in preparation). But beyond these very striking differences, what matters for our argument here is that, as far as we know, it is very safe to say that the general mapping Time Events Are Things In Space is universal (or at least extremely predominant).

The issue of universality also raises another question: Is it possible to observe cultures in which time events are conceived in terms other than objects in space, say, in terms of sweet-and-sour tastes, chromatic experiences, or blood pressure sensations? The answer is quite simple: there is no evidence that such a case exists. In all the languages studied so far — oral and written — time events are in one way or another conceived in terms of things (entities or locations) in space. We simply don’t observe the conceptual structure of time flow based on domains of human experience such as tastes, flavours, or colours. Given this, the future can’t taste purple.

It is worth mentioning that in all cultures studied so far, the mapping Time Events Are Things In Space is not taught deliberately and systematically at school or through any form of specific instruction. These observations suggest that such mappings are not mere social agreements or conventions. If that were the case, one would expect as many experiential modalities generating these conceptual mappings, as social and cultural environments one encounters. The stability and universality of these conceptual mappings supports the idea that they are shaped by non-arbitrary species-specific peculiarities of our brains and bodies. These fundamental specificities allow individuals to use these mappings effortlessly, often unconsciously, and in an extremely fast, precise, unambiguous, and accurate manner. In sum, human beings, no matter the culture, organize chronological experience and its conceptual structure in terms of a very specific family of experiences: the experience of things in space.

The primacy of the inherent bodily orientation in the mapping

Now, let us analyse what we can learn from the fact that an inherent bodily orientation structures the very core of the mapping Time Events Are Things In Space. At first glance, this issue may seem a superficial one, but it isn’t. In fact, it has deep theoretical and philosophical implications. Consider, for instance, the following question.

Why should an abstract inferential mechanism such as the one we use to make inferences about time events require an implicit, precise, and unambiguous bodily orientation? After all, if the cognitive mechanism were really inherently abstract (as traditional mainstream cognitive science has postulated for decades), it shouldn’t need anything concrete such as a bodily orientation! When you do your empirical observations, however, you observe that the inherent bodily orientation is everywhere. How can that be?

The mapping Time Events Are Things In Space under the ego-based metaphor, does make explicit reference to a bodily orientation. To be more precise, both forms of that metaphor — Ego-Based Form 1: Time Passing Is Motion Of An Object and Ego-Based Form 2: Time Passing Is Motion Over A Landscape — explicitly state that:

• future times are in a specific orientation relative to the speaker’s body, namely, in front of him/her (in our culture), and
• past times are in another specific orientation relative to the speaker’s body, namely, behind him/her (in our culture).

Because of the way in which the source domain of the metaphor is structured (objects in space being in front/behind the observer, etc.), and because of the structure of the projections to the target domain (things in front/behind the observer are future/past times, etc.), the mapping itself establishes a precise bodily orientation of the observer relative to the times. If we want to understand the subtleties of this phenomenon and its theoretical implications, seeing human reason as a purely abstract logical phenomenon does not help. Such a disembodied view wouldn’t help us to answer the following questions: First, why is there a bodily orientation at all? And second, why do we observe a specific bodily orientation? In fact, from a purely abstract point of view, you don’t need a particular bodily orientation — say, with the future in front of us — in order to keep the inferential structure provided by the mapping. We could still keep the same rich inferential structure preserving, for example, order and transitivity if future times were, say, above one’s head and past times under one’s feet. In other words, if time-space cognition was a purely disembodied abstract logic phenomenon, one would expect different languages, cultures, or even individuals manifesting all kinds of different bodily orientations with respect to a one-dimensional landscape. Any kind of bodily orientation would do it, even an orientation having, say, the past in the upper right front of the body and the future in the lower left rear. But empirical data show that this is not the case. There is one bodily orientation that is predominant in a wide range of human cultures, namely, the future as being ahead of us and the past as being behind. If we are really serious about studying the mind, we can’t ignore this simple but important fact. This means that in explaining this (and any) human conceptual apparatus, we must propose a research programme that considers, in an essential way, the primacy of the peculiarities of the

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[6] One could argue that in our culture it is also possible to find situations in which the past is conceived as being on the left of the speaker, and the future as being on the right. Such is a specific case of the time-based metaphor, in which the times are ordered in a sequence before the eyes of the speaker (the speaker is outside the space of the sequence). In such a case, terms like ‘before time t’ apply to the front of time t, not to the front of the speaker. This specific case of the time-based mapping underlies more sophisticated conceptual domains such as graphics of functions in the Cartesian plane where time is the independent variable (Lakoff and Núñez, 2000).
human body, bodily experiences and actions which underlie basic forms of human sense-making. Regarding the bodily orientation involved in our time-space case study, this means proposing an explanation that, among others, takes into account fundamental features of human movement. For instance, normally when we walk,

- we do it in one direction (we don’t do it in two directions at a time, or spreading out over a surface),
- we do it in the direction of the orientation of our visual field (not, say, towards the auditory field of our left ear),
- we do it keeping our heads stable relative to the ground (unlike our hands or elbows, which are not) so we experience vision as being stable,
- we do it faster when we move frontally rather than laterally or backwards,
- our movements forwards are more precise than those done backwards or sideways,
- our movement forwards requires less attention and coordination efforts than, say, moving backwards,
- our head is the part of the body which is the most distant from the ground (unlike when we sleep),
- we spend energy, and eventually get tired,
- we are erect and at any moment we can run (unlike when we are on our knees),
- and so on.

The moral

So, what have we learned from our time-space case study? We have learned that the resulting explanatory proposals of these sort of phenomena should be made in terms of basic cognitive mechanisms emerging from fundamental human experiences in a real environment as they are shaped by bodily properties and biological constraints. When explaining human conceptual systems, purely abstract, logical, and a priori considerations about time and space are secondary to these most fundamental species-specific peculiarities of the human body and brain. As Esther Thelen puts it, ‘Even when adult cognition looks highly logical and propositional, it is actually relying on resources (such as metaphors of force, action, and motion) developed in real-time activity and based on bodily experience’ (Thelen, 1995, p. 323). It would be a big mistake to consider the predominant bodily orientation in the mapping Time Events Are Things In Space as an accident, as anecdotal data, or as a mere physical instantiation secondary to a purely abstract form of reason. A theory of mind and cognition must consider the primacy of the specific constraints of our bodily grounded experience shaped by the peculiarities of our brains and bodies. In sum, what we have learned from our case study is that in order to understand cognition and the mind, one must conceive them as fully embodied phenomena.

But, what do we mean exactly by ‘embodiment’? At this point we have to be careful, because the term ‘embodiment’ has become very fashionable (and polysemous) in contemporary cognitive science and philosophy of mind. Therefore, we need to be much more specific and avoid misunderstandings.

What Embodiment for Reclaiming Cognition?

In the last couple of decades, the study of the mind has experienced an interesting (and gradual) shift. There has been a tendency to move from a rational, abstract, culture-free, centralized, non-biological, ahistorical, unemotional, asocial, and disembodied view of the mind, towards a view which sees the mind as situated, decentralized, real-time constrained, everyday experience oriented, culture-dependent, contextualized, and closely related to biological principles — in one word, embodied (Núñez, 1995). This gradual shift has produced terms such as ‘embodiment’, ‘embodied mind’ or ‘embodied cognition’ (for details see Clark, 1997; Johnson, 1987; Lakoff, 1987; Varela et al., 1991). These terms, however, have not been used in a monolithic and coherent manner in the various disciplines of cognitive science and its various theoretical approaches. Moreover, with rare exceptions they often have lacked a precise operational characterization. As a result, we find several notions of embodiment which, while sharing a common core, differ on important theoretical points and philosophical implications. Let us see them in more detail.

Levels of commitment: trivial, material, and full embodiment

From a very general perspective, we can at least distinguish three major levels of understanding the term ‘embodiment’ which are directly related with the levels of commitment involved. I will call them trivial, material, and full embodiment.

Trivial embodiment: It affirms what today is obvious for many, that is, that cognition and the mind are directly related to the biological structures and processes that sustain them. Nowadays, few scholars (perhaps with the exception of orthodox cognitivists and transcendentals) would disagree with this idea. This view holds not only that in order to think, speak, perceive, and feel, we need a brain — a properly functioning brain in a body — but also that in order to genuinely understand cognition and the mind, one can’t ignore how the nervous system works. Compelling evidence coming from contemporary neuroscience and neuropsychology has made this view quite popular. As a result, this level of commitment regarding embodiment is today quite uncontroversial.

Material embodiment: This view not only claims that cognition (and the mind) is made possible by the underlying neurobiological and bodily processes. It also explicitly develops a paradigm (and a methodology) that has two main features. First, it sees cognition as a decentralized phenomenon, and second, it takes into account the constraints imposed by the complexity of real-time bodily actions performed by an agent in a real environment. These features depart in an essential way from more classical approaches to cognitive science. Material embodiment has, in general, oriented itself towards low-level cognitive tasks. As a result, it does not have to confront certain basic issues of high level cognition such as the nature of conceptual systems as such. One can endorse material embodiment to study, say, visual scanning or locomotion, without being constrained to make any particular commitment about how these bodily actions may ground the very nature of human concepts and logic. In material embodiment, you may thus implicitly assume the existence of concepts in an a priori way (e.g., square-root-of-two, the-future-ahead-of-us) without being constrained to say much about their nature and inferential structure. The commitment does not apply to all of cognition.
Full embodiment: It shares the basic tenets of trivial and material embodiment, but it goes further. It has a commitment to all of cognition: from the most basic perceptive activity to the most sophisticated form of poetry and abstract thinking. Full embodiment explicitly develops a paradigm to explain the objects created by the human mind themselves (i.e., concepts, ideas, explanations, forms of logic, theories) in terms of the non-arbitrary bodily experiences sustained by the peculiarities of brains and bodies. An important feature of this view is that the very objects created by human conceptual structures and understanding (including scientific understanding) are not seen as existing in an absolute transcendental realm, but as being brought forth through specific human bodily grounded processes. Conceptual systems and forms of understanding are not considered a priori, but they become subject matters to be explained in real-time bodily grounded terms. From this perspective, not only are colour categories embodied and are not out there in the world, but so is the concept of democracy, the truth of Pythagoras' theorem, or the essence of any mathematical object (Lakoff and Núñez, 2000).

Needless to say, full embodiment is (still) way more controversial than trivial and material embodiment. However, our time-space case study — being about conceptual structure and high level cognition — clearly illustrates the necessity of endorsing full embodiment. If we need to understand the primacy of the inherent bodily orientation which is at the core of the conceptual mapping Time Events Are Things In Space, trivial and material embodiment do not suffice. We must understand the conceptual structure involving elements such as future-being-in-the-front, past-being-in-the-back, and so on, not as a priori transcendentally objective ideas, but through the peculiarities of our brains and bodies that make them possible. What is needed then is an embodied-oriented commitment to all of cognition. Full embodiment then becomes a must.

Choices of theoretical assumptions and methodologies

But beyond these three levels of commitment, there are more nuances we have to make regarding the term 'embodiment'. The gradual paradigm shift that I mentioned at the beginning of this section originated from a need to overcome the limitations of early cognitivism and the more recent connectionist approaches (for details, see Varela, 1989; Clark, 1997; Freeman and Núñez, in this volume). Essential to this enterprise was to develop a new approach to a paradigmatic problem: the neglect of the body and the environment in which the organizing organism exists. Although philosophers such as Edmund Husserl, and Maurice Merleau-Ponty, as well as ecological psychologists such as James Gibson, had seen already the centrality of body and environment for the understanding of the mind, cognitive science took a long time to make the first steps in this direction. Endorsing this new view meant to take seriously such domains as everyday life, the environment, bodily experiences, real-world and real-time action, and so on. As a result, an important group of new approaches, in various disciplines, proceeding with rather different methodologies, headed towards investigating cognition as a product of complex adaptive behaviour emerging from on-going action on the part of an agent which is always immersed in a real-world environment, and with physical and real-time constraints. This provided core properties for a new way of conceiving cognition.

The process, however, didn’t produce a monolithic understanding of ‘embodiment’. In fact, the heterogeneity of disciplines and methodologies generated a sort of polysemy of the term embodiment. Depending on what aspects of the core notion you privilege, you obtain a variety of different meanings with their own theoretical implications. For instance, taking the ‘agent’ to literally be any autonomous agent, natural or artificial, entails that fundamental properties of the organization of the living phenomenon are not taken as essential (e.g., morphogenesis, biochemistry of synapses, etc.). This gives you the notion of ‘embodiment’ used in modern cognitive robotics and autonomous agent theory (Brooks and Stein, 1993; Clark, 1997; Pfeifer and Scheier, 1999), which does not apply to the work by Maturana and Varela (1987) in theoretical biology, and Núñez (1995; 1997) in philosophy of mind. Similarly, taking as essential the explicit rejection of computationalism and representationalism in favour of the use of the tools of dynamical system theory, would give a notion of ‘embodiment’ that would apply to the work by Thelen (1995; see also Iverson and Thelen in this volume) in developmental psychology, and by Skarda and Freeman (1987; see also in this volume) in neuroscience, but not to the work by Mark Johnson (1987) in philosophy of mind, or to the one by Feldman and Regier in structured connectionism (Feldman et al., 1996; Regier, 1996). Or taking the bodily grounded experience as essential would give a notion of ‘embodiment’ that would apply to the work of Lakoff and Núñez in mathematical cognition (1997; 2000), and to that of Csordas (1994) and Lock (1993) in anthropology, but it wouldn’t apply to real-world robotics. In sum, among scholars directly involved with embodiment, there are different, methodological, and philosophical differences. For some scholars, the embodied mind is literally computational, for others, it is metaphorically computational, and for others, it is not computational at all; for some, it is inherently an emerging phenomenon proper to certain forms of living systems, and for others, it is not; for others, its study requires the use of certain methodologies such as the tools of dynamical system theory, and for others, it does not; for some, the living phenomenological bodily experience is essential, and for others, it is not; and so on. Basically, the situation is as if you pick your favourite feature of the core properties, bring them to the foreground, add your own theoretical flavour, stir with your own vintage, and you get your ‘embodiment’ à la carte. So, what is the view of embodiment I endorse here? In a nutshell, a non-computational view that emphasizes the primacy of the organization of the living and the resulting bodily experience it sustains.

Conclusion

The time–space case study provides a wonderful opportunity to learn several essential dimensions of the human mind. Conceptual structures are not purely abstract logical entities merely instantiated in our bodies, but are stable and precise forms of sense-making that come out of the peculiarities of brains and bodies, and the bodily grounded experience they sustain. The analysis of the conceptual mapping Time Events Are Things In Space has shown this for the particular concept of time flow. That analysis has allowed us to see how the primacy of the bodily orientation and

[7] Such a view wouldn’t apply either to Andy Clark’s idea of embodiment (1997). In fact, Clark calls such a view “Radical Embodied Cognition” (p. 148).
real-time bodily action is at the very core of the cognitive mechanisms that make the concept of time flow possible. From that, we have learned that in order to study cognition and the mind in an adequate way, one needs to reclaim the traditional notions of mind, body, and cognition. One needs to understand cognition and the mind as fully embodied phenomena. This is an interesting, though not simple, challenge. It implies endorsing a view of embodiment with the following specific features:

• A level of commitment seeking to understand the fundamental human bodily experience that grounds all forms of sense-making, from basic motion, to everyday common sense, to scientific theories and formal logic.

• A choice of theoretical and methodological orientations that emphasize the dynamic biological (structural) co-definition that exists between living organisms and the medium in which they exist, from which bodily grounded experience and cognition result as real-time enactive processes.

But there is more. Reclaiming cognition from this perspective (i.e., an embodiment-oriented commitment to all of cognition) implies also something much deeper: the rejection of at least five harmful dogmas that lie at the very foundations of much of current cognitive science and philosophy of mind (for details, see Núñez, 1997):

1) the a priori assumption that there is a pre-given objective reality independent of any human understanding (including conceptual systems);

2) the idea that epistemology is absolutely subordinated to ontology;

3) the idea that there is a strict objective-subjective dichotomy;

4) the assumption that the body must be excluded from the study of the mind; and

5) the idea that the mind can be reduced to the study of neurophysiological processes of individual brains alone.

The analysis of our time-space case study implies that in order to adequately address the questions involved, one needs to reject these dogmas. The reasons are straightforward. Adopting a pre-existing God’s-eye view (dogma 1) of what time and space objectively and transcendently are (e.g., assuming that space is Euclidean and three-dimensional) hides the very phenomenon we want to study. That is, how humans through everyday cognitive mechanisms bring forth, create, and conceptualize the idea of time flow. Besides, assuming that ‘merely’ epistemic issues cannot address pre-existing ontologies (dogma 2), impedes us in asking the very question of the nature and origin of the pre-existing God’s-eye view: What kind of brain sustains God’s-eye view? As a result, this dogma doesn’t allow us to understand how human beings enact systematic forms of everyday sense-making to create stable abstract concepts such as time and space (including the very idea of God’s-eye time and space!). Similarly, a strict objective-subjective dichotomy (dogma 3) impedes us in understanding the rich spaces of commonalities and inter-subjectivity that exist in human conversations, preventing us from understanding the amazing inter-individual inferential stability based on shared species-specific bodily grounded experiences. Then, there is the absence of the body. Not considering the primacy of the body in the study of the mind (dogma 4) simply leaves us without tools to understand, for example, why there is a bodily orientation at the core of the concepts of time flow.

Finally, reducing the biological processes to strictly individual brains (dogma 5), impedes us in understanding our brains as organs of social action, and therefore in comprehending the biological basis of inter-subjectivity. In sum, in order to reclaim mind, body, and cognition, we must free ourselves of these dogmas. The time to develop a richer and deeper science of the mind ‘has come’.

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