Travelling in Time and Space
at the Origins of Language

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ABSTRACT

In this paper we propose a narrative hypothesis on the nature of language and a proto-discursive hypothesis on the origin of our communicative abilities. Our proposal is based on two assumptions. The first assumption, concerning the properties of language, is tied to the idea that global discourse coherence governs the origin of our communicative abilities as well the functioning of these abilities. The second assumption, concerning processing devices, is connected to the idea that the systems of spatial and temporal navigation are implicated in discourse coherence processing. Analysis of the relationship between these two assumptions allows us to integrate the model of language based on clues proposed by Sperber and Wilson with Relevance Theory with the discursive foundation of human communication. In this respect, our proposal can be considered as a tentative extension of Relevance Theory (both at the level of properties and the level of cognitive systems).

Keywords: discourse coherence, mental time travel, mindreading, origin of language, protodiscourse, relevance theory, spatial navigation, storytelling.

1. Introduction

In this paper we propose a narrative hypothesis on the nature of language and a proto-discursive hypothesis on the origin of language. These hypotheses are based on two assumptions: the first concerns the level of the properties of language; the second pertains to the level of processing devices. Regarding the properties, to argue that human communication has a narrative foundation and a proto-discursive origin necessitates assigning a leading role, among the

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characteristics of language, to global coherence (a pragmatic property). Regarding cognitive architecture, the reference to global coherence implies the presence of cognitive devices capable of processing a type of information very different from that processed by the devices that analyze the constituent structure of sentences. At the basis of our hypothesis is the concept that the narrative foundation of language and its proto-discursive origin are closely related to the functioning of cognitive systems that allow individuals to identify a goal to move toward as well as to construct and keep the correct route in order to reach it. In other words, both the actual functioning of language and its evolutionary roots rely on processing devices governing navigation in space and time.

2. The narrative nature of human language

Sciences focused on the mind as well as on evolution have produced results that, in turn, greatly influence the study of human narrative capacity, which is currently the center of a compelling debate (Boyd, 2009; Collins, 2008, 2013; Dautenhahn, 2002; Gottschall, 2012; Gottshall and Wilson, 2005; Herman, 2013; Hirstein, 2005; Sugiyama, 2005). One of the hottest conceptual issues in this debate is the question of whether the ability to tell stories (i.e. storytelling) is an evolutionary side effect with no impactful role in the adaptation of our species (Bloom, 2010), or if the human capacity for narrative does indeed play a specific evolutionary role (Boyd, 2009; Pinker, 2007). Gottschall (2012), for one, asserts that storytelling capacities play an important adaptive role in human evolution. In his view, narrative ability works in a very similar way to a flight simulator: it allows humans to gain experience of the most intricate affairs of life by sitting safely in a literal or figurative armchair.

   In this article we do not intend to take a position on the nature of human narrative ability, rather we aim to propose a hypothesis on the nature of language. Nevertheless, our inquiry is closely tied to the analysis of storytelling ability: at the basis of our hypothesis is the idea that the conversational exchanges that characterize human communication have an eminently narrative dimension, and that the discursive character of language is the key to investigate its nature, its functioning and its origin. In effect the discursive dimension of language represents the point of convergence between the

properties (and the processing devices) of language that govern its functioning and the properties (and the processing devices) which led to its origin. Following this, an important methodological indication emerges—the possibility to investigate the steps that have given rise to language through the study of its actual functioning. Following such an indication, the first part of this paper will focus on the analysis of the functioning of human communication.

3. From microanalysis to macroanalysis

Although it may seem an interpretative hypothesis distant in time and long ago overtaken by events, the "principle of formality" (the idea that the computational devices only have access to the form of representations) at the base of cognitive orthodoxy (Haugeland, 1997; Fodor, 1975) continues to have an enormous influence on models of human communication that, focused on the primacy of syntax, consider the constituent structure of sentences as the essential and distinctive feature of language.

At the basis of such an interpretive hypothesis is a general perspective about the nature of the mind, and in particular about the (propositional) nature of thought characterizing the great part of the philosophy of language of the twentieth century. We will not discuss the issues related to this hypothesis that are already well known. For the purposes of our argument it is sufficient to focus on two aspects of the perspective of language related to the principle of formality: the implicit (explicit, sometimes) adhesion to the code model of communication (Shannon & Weaver, 1949), and the adherence to the idea that the sentence (and its internal constituents) represents the essence of human language. These two aspects are closely related. In fact, the code model is founded on the close parallelism between thought and language. According to Fodor (1975, 1987), this parallelism is a consequence of the fact that the logical structure of sentences is nothing but the product of the propositional structure of thought. Before considering the reasons that led us to abandon the linguistic perspectives inspired by cognitive orthodoxy, it is necessary to say a few words about the code model, a model that Fodor (1975, p. 106) considers «not just natural but inevitable».

3.1 Communication based on clues

The code model of communication seizes upon the idea that «we have communicated when you have told me what you have in mind and I have understood what you have told me» (Fodor, 1975, p. 109). According to this model, the thought (i.e. the message) is encoded by the speaker in a succession of sounds that the listener decodes to be able to share the thought (the message) that the speaker has intended to communicate. Perhaps because of its intuitive plausibility, the code model has been considered the model of communication for centuries, and these days it is at the center of theoretical reflection on the nature of language (consider Chomsky's Universal Grammar, just to name one famous case).

Despite its popularity, the code model is completely ineffective from an explicative point of view. The most compelling criticism of this model has been made by Sperber and Wilson (1986; 2002) with Relevance Theory (RT). Revisiting Grice's intuition (Grice, 1968) from a cognitive perspective about the distinction between "speaker's meaning" and "sentence's meaning", the two authors have strongly questioned the idea that communication is governed by a parallelism between what is said and what is thought. The case of figurative language is the most obvious example of the difference between the literal meaning of the expressions uttered by the speaker and the informational content that she intends to communicate.

Data in favor of RT come from language pathologies. Autism is widely used in studies of cognitive pragmatics as evidence in favor of the role of the speaker's intentions in the processes of language production and comprehension (Happé, 1993; Happé & Frith, 1995; Sperber & Wilson, 2002; Wearing, 2010). One of the prevailing ideas in the literature is that people with autism remain stuck on the literal meaning because of a specific deficit in the system of Theory of Mind (ToM), the cognitive device underlying the capacity for mentalization that allows humans to attribute mental states to others as well as to themselves (Baron-Cohen et. al., 1985; Happé & Frith, 1985; Happé 1993). From this perspective, the difficulties typical of subjects with autism related to the pragmatics of language depend on what Baron-Cohen (1995) called "mindblindness", the difficulty of these individuals to see people around them as endowed with mental states. Even though the idea that the communicative deficits of autistic people are simply caused by an

impairment of ToM has been revised and expanded (Frith & Happé, 1994; Tager-Flusberg, 2007), the relationship among autism, mindreading systems and RT has been confirmed recently (e.g., Wearing, 2010).

Questioning the code model, emphasizing the gap between what is said and what is meant, allows us to consider the idea that the communicative expressions are only clues that the speaker offers the listener to enable her to interpret his communicative intention. Considering linguistic expressions as clues (rather than as encoded signs) is of great interest for our discussion. In addition to allowing us to understand the functioning of language, the clues model of communication is an important starting point for the analysis of the origin of language. We will return to this topic in the last part of the paper. Before opening the *pars costruens* of our argument, we must still consider a second difficulty of the code model: the priority assigned to the sentence in the production-comprehension processes.

3.2   From sentence to discourse

We do not discuss here the fact that the constituent structure of the sentences represents an important aspect of language processing. The question we ask is whether an analysis focused only on what happens within sentences is a sufficient condition to account for the production-comprehension of human language. The case of subjects who, in spite of their ability to produce well-formed sentences, are unable to efficiently communicate, invites us to respond negatively to the question. The cases of patients suffering of forms of derailment (as schizophrenics) (Marini et al. 2008), or subjects unable to maintain the route of speech as people with brain injuries (Marini et al., 2011; see Adornetti, this volume), show that the ability to construct and understand well-formed sentences is not a sufficient condition for the production and comprehension of discourse. Cases of this kind pave the way to two considerations: first, discourse processing requires different principles (and different processing devices) from those governing the construction of sentences; second, and more important for our purposes, the sentence cannot be considered to be the essence of language.

At the basis of this paper is the concept that the most important issues for the analysis of language functioning and origin are related to properties and processes that regulate the relationship between sentences (macro-analysis),

rather than those that govern the relationship between internal constituents of the sentence (microanalysis) (see Davis et al., 1997; Marini et al., 2008). More specifically, our idea is that the origin and functioning of language have to do with global coherence, a pragmatic property that allows individuals to "keep the route" in discourse production. Central to our proposal is the notion that global coherence is primarily a property concerning cognition (and only secondarily, language) and that the processing of this property needs specific computational systems–although not specific for language. Given the importance of coherence in our hypothesis, the first step of our argument is to demonstrate coherence's autonomy and its independence from other linguistic properties.

The first move in this direction is the defense of the non-reducibility of coherence to cohesion, that is the linguistic connections between consecutive statements (i.e. by means of anaphora or pronouns). In sharp contrast with the tradition that maintains that discourse coherence is dependent on the cohesive ties between sentences (e.g. Daneŝ, 1974; Halliday & Hasan, 1976), empirical evidence and theoretical arguments show that cohesion is neither a necessary nor sufficient condition of coherence (Giora, 1985). In this volume, the issue of the irreducibility of global coherence to cohesion is analyzed in the article of Adornetti (to which I refer for details): we consider the reasons proposed in this article compelling, and we will assume them going on in our argument. That said, before proceeding, it is necessary to emphasize the important role that the debate over cohesion *vs* coherence plays in the discussion of cognitive architectures.

The advantage of reducing coherence to cohesion is represented by reference to a unique processing system: if the external relations between sentences depend the analysis of some internal components of sentences, then the device used for microanalysis also is able to account for macroanalysis. Having shown that discourse coherence cannot be interpreted in terms of cohesion therefore implies a reference to different cognitive systems than those involved in microanalysis. To explain the nature of these devices is a key point of our theoretical proposal. Before taking into account the issue of cognitive architectures, however, it is necessary to consider a second aspect of the conceptual debate on global coherence. This is the "friendly fire" of the proponents of RT: according to Sperber and Wilson, although not reducible to cohesion, coherence is reducible to relevance. Given the importance that the clues model of communication and RT play in the theoretical framework of this

paper, the attack that the two authors make on the autonomy of coherence deserves to be carefully analyzed.

4. Extending Relevance Theory

4.1 Why Relevance is not enough

At the basis of our proposal is the idea that the origin of language and its functioning are tied to a perspective in which the clue model fits with the discursive nature of human communication. From this perspective, the first step is to ask if coherence is reducible to the principle of relevance. Sperber and Wilson are explicit in this regard: since relevance is the (unique) principle through which any aspect of human language can be analyzed, even discourse coherence must be interpreted in reference to this principle (Sperber and Wilson 1986/1995, p. 289; Wilson, 1998). Giora (1997, 1998) criticized Sperber and Wilson's thesis. In her view, in fact, relevance is not able to account for any aspect of language. Specifically, when we move from the sentence level to the discourse level, relevance is not a criterion that can explain global coherence. In support of her hypothesis, Giora shows examples of expressions that respect the principle of relevance, but are incoherent in terms of their relation to each other, and examples of expressions that are coherent, even if they are not relevant in the context. A useful example for demonstrating Giora's position concerns the situations in which it is possible to distinguish between different *degrees of coherence*. Consider the cases of (1a) and (1b):

(1a) This first time she was married her husband came from Montana. He was the kind that when he was not alone he would look thoughtful. He was the kind that knew that in Montana there are mountains and mountains have snow on them. He had not lived in Montana. He would leave Montana. He had to marry Ida and he was thoughtful (taken from Ida by Gertrude Stein).

(1b) The first time she was married her husband came from Montana. He was the kind who loved to be alone and thoughtful. He was the kind who

> loved mountains, and wanted to live on them. He loved Montana. But he
> had to marry Ida and leave Montana (Giora, 1997, p. 26).

Giora's interpretation is that the difference in coherence between the two discourses cannot be explained in terms of "contextual effects weighed against processing effort", that is in reference to the principle of relevance as conceived by Sperber and Wilson. In fact, according to Giora, as the two discourse are both relevant, «they nevertheless differ drastically in terms of coherence: (1b) is more coherent than (1a)» (Giora, 1997, p. 26). Because RT is unable to explain the coherence differences between (1a) and (1b), the general conclusion to be drawn from these considerations is that «coherence is not a derivative notion» (Giora, 1997, p. 22). Good news for the autonomy of coherence.

   What makes the evaluation of coherence specific? Giora's thesis is that narrative comprehension relies on the identification of the causal links governing the relationship between segments of discourse: in order to judge a discourse coherent or incoherent (or not fully coherent), in other words, it is necessary to refer to the concept of well-formedness. We will not go into the details of the debate between Giora and Wilson. The issue that needs to be highlighted for our purposes is that the argument used by Wilson (1998) to argue that the judgments of coherence are completely reducible to the judgments of relevance rests precisely on well-formedness analysis. Her opinion is that the question of well-formedness is not a matter of relevance because RT is a theory of comprehension, and the issues relating well-formedness concern judgments and evaluations not involved in the psychological processes of comprehension. According to Wilson, in fact, the sense of incoherence that listeners feel with the fragments of discourse presented by Giora must be interpreted with reference to:

> the manifest waste of effort spent in looking for relevance in the wrong
> direction, or failing to find it at all. The resulting interpretations will be
> inconsistent with the principle of relevance, *whether or not the*
> *discourse segments are related.* By the same token, what makes a
> discourse (...) acceptable in the circumstances described is the fact that
> it has an interpretation consistent with the principle of relevance,
> *whether or not the discourse segments are related* (Wilson, 1998, p.
> 67 italics added)

That being the case, all you need to process a discourse is a system capable of grasping the communicative intention of the speaker, independently of how the speaker organizes the segments sequence in the communication flow. The explanatory weight of the clues model is entrusted to the study of the processing systems involved in the effort to looking for relevance. In favor of RT there is a model of cognitive architecture perfectly suited to the theory: if all you need to account for discourse coherence is relevance, then all you need to process coherence is a system of mindreading.

From Wilson's argument, it is clear that in order to maintain that coherence is reducible to relevance it is necessary to maintain that the way in which discourse segments are related can be excluded from the comprehension processes. Nevertheless, contrary to this argument, Ditman and Kuperberg (2007), in an article on the ability of schizophrenics subjects to project over time, showed that the problems these patients had in maintaining the coherence links across sentences was due to the fact that «building a coherent representation of discourse (...) requires the establishment of logical and psychological consistency between the events and propositions described in individual sentences» (Ditman & Kuperberg, 2007, p. 992). It is difficult to account for the psychological and logical consistency between events and propositions without referring to the causal relationships between the events narrated in a discourse and the segments of the speech used in the narrative to express them. The emphasis that Giora puts on the issue of well-formedness fits with the idea that the way to organize the temporal sequence of expressions (to put in the correct way the segments of the speech in the narrative flow) plays a decisive role in the inability of schizophrenics to build a coherent representation of discourse. It goes well with this idea especially because of the fact that well-formedness, invoked to explain discourse coherence, is not (given the independence of coherence from cohesion) a property that linguistic grammar imposes on thought - coherence is a property of discourse because well-formedness is primarily a property of the flow of thoughts. That said, since it is difficult to argue that an essential character of the flow of thoughts is not implicated in comprehension processes, the criticism toward well-formedness is not enough to justify the reducibility of coherence to relevance, despite what Wilson is willing to recognize. So much for the question of the properties of language. It is time to take into account the issue of cognitive architectures.

4.2 Why mindreading is not enough

One major difficulty in Giora's model (on this point Wilson is absolutely right) is that she does not have a proposal regarding the specific cognitive systems involved in the discourse processing. In our opinion, the litmus test of the dispute on the reducibility of coherence to relevance concerns the cognitive architectures: since RT focuses on a single processing system (mindreading), two questions have to be addressed for the purposes of our discussion. Regarding the actual functioning of language: Is a mindreading system sufficient to account for the human ability to process discourse? Regarding the origins topic: Is a mindreading system sufficient to account for the transition from animal communication to human language?

What we want to discuss here is not whether a mindreading system has a role in language processing: the point to be discussed is whether the mindreading system is really the only biological adaptation (Tomasello, 1999) at the base of the origin and functioning of language. Sperber and Wilson (1986, 2002; but above Sperber, 2000 and Origgi & Sperber, 2000) agree with Tomasello. From their point of view, the thesis that relevance is the only explanatory principle of language fits with the idea that mindreading is the only system underlying our communication skills.

From our point of view the processing systems required to explain language have to draw together the clues model of communication with the discursive foundation of language governed by coherence. In this perspective the problem of the models based on mindreading is that, by focusing exclusively on the interpretation of the speaker's intention, they leave out the discursive foundation of human communication. One way to try to understand how to put together the clues model with the narrative foundation of language is to ask for what kind of systems are required to process discourse coherence. The metaphor of the flow of discourse given by the ability to "keep the route" in conversation is the starting point of the *pars costruens* of our article. At the basis of our hypothesis, in fact, is the idea that coherence is guaranteed by the systems that allow humans to navigate through space and time.

5. Navigational communication

Our starting point here is a quote from Chafe (1987, p. 48), taken by Wilson in her dispute with Giora. Wilson is right to claim that:

> [D]iscourse is best approached in terms of process than structure: "it is more rewarding, I think, to interpret a piece of discourse in terms of cognitive processes dynamically unfolding through time than to analyze it as a static string of words and sentences" (Wilson, 1998, p. 70).

We agree with this perspective, provided, however, one seriously considers the "unfolding through time" of the computational processes involved in the flow of discourse. In fact, in discourse processing the projections back and forward in time (monitoring what the speaker says with respect to what she has already said and anticipating what the speaker will say) are at the basis of the construction of the route in the flow of speech. Now, in spite of the emphasis that Wilson reserves in the Chafe quote, the theory of relevance is not equipped in terms of cognitive architectures to account for processes involving the temporal plane. For this purpose, the system of mindreading is not a sufficient condition: what we need is *Mental Time Travel* (MTT), a cognitive system that enables an individual «to mentally project themselves backwards in time to re-live, or forwards to pre-live, events» (Suddendorf & Corballis 2007, p. 299; Corballis, 2011).

There are two things to consider in regard to MTT.

The first follows what Gärdenfors (2003, 2004, see also his article in this volume) argues with respect to the way Tomasello (1999) addresses the question of the origin of human communication: in the same way in which the speaker's communicative intention is a necessary but not sufficient condition to explain human language functioning, the mindreading device is a necessary but not sufficient condition to process language. In Gärdenfors' (2003, 2004) and Osvath and Gärdenfors' (2005; Gärdenfors & Osvath, 2010) opinions, to account for the origin of language, it is necessary to access the human capacity to anticipate the future (anticipatory cognition): from this perspective, language is the product of cognitive systems that allow individuals to break away from the here and now of the present situation in order to plan future goals. At the root of human communication is a form of future-oriented

cooperation: without a specific system of temporal processing, human language would never have originated, nor would it work the way it works (Cosentino, 2011; Cosentino & Ferretti, 2014; Ferretti & Cosentino, 2013).

The second consideration relates directly to the relationship between MTT and human narrative abilities. Neisser (2008) points out that remembering is much more akin to telling a story than to playing back a tape or looking at a picture. Corballis (2011, p. 111; see his paper in this volume) maintains that «the same constructive process that allows us to reconstruct the past and the construct possible futures also allows us to invent stories» (Corballis, 2011). Behind the considerations made by Gärdenfors and Corballis lies the first reason that Relevance Theory needs to be expanded: if language (and narrative abilities, specifically) call into question a navigation device in time, then mindreading cannot be considered a unique processing system at the foundation of human communication. But there's more.

In addition to underlie the relationship between MTT and human narrative abilities, Corballis also makes a more general statement of great relevance to our discussion. In his view, in fact, time navigation is closely related to space navigation:

> Several of the critical properties of language, then, probably evolved from the relaying of events, whether past, present, future or fictional, most of them located at times other than the present, including imaginary time. Other times also means other places, since we are peripatetic creatures, restlessly moving about the planet – and occasionally off it (Corballis, 2011, p. 114).

Birds' migration is the most intuitive and clear case demonstrating the close connection between time and space (Berthold, 2000). The same thing applies to humans:

> Despite every navigator's preoccupation with distances and angles, latitudes and longitudes, and headings and compasses, nearly all human navigation rests on a basis of understanding and measuring time. We need to know when to start, what direction to choose relative to the sun or stars, how long we've been moving if we wish to compute distance travelled, when to stop, or that most challenging task of all, how to determine relative time so we can deduce longitude (Gould and Gould, 2012, pp. 36-37).

The close link between space and time representation is well demonstrated by brain anatomy (Corballis, 2013). The discovery of place cells allowed O'Keefe and Nadel (1978) to argue that the hippocampus is the basis of spatial cognition in rodents and is the substratum for episodic memory of humans (Dudchenko, 2010). Having said that, there is also a relationship of priority between space and time. In effect, navigation in space has logical and temporal priority over navigation in time; that is to say, the ability to project oneself in time is based on the ability to project oneself in space. When one looks at the coherence of discourse as a phenomenon linked to the ability to build and maintain the route toward a goal, it is primarily the spatial navigation metaphor to which we look.

Speaking of spatial navigation, in this paper we analyze almost exclusively the distinction between processes that occur in the head (inner navigation) and processes (route navigation) that occur during actual navigation on the ground (Yoder, Clark, & Taube, 2011). It is a known and empirically verified fact that route-based representations are dependent on brain structures (i.e., lingual gyrus, calcarine cortex, fusiform gyrus, parahippocampal cortex) that are different from those implicated in the use of mental maps (Epstein, 2008). Very roughly, a distinction from inner and outer navigation enables us to distinguish between internal processes as the sense of direction and the construction of a mental map and external processes such as maintenance and realignment of the route during effective navigation. Such a kind of distinction is at the foundation of the tight relationship between spatial navigation and discourse production.

5.1 Inner navigation

Spatial navigation represents, even intuitively, a good metaphor for thinking about the processes at the foundation of discourse. Lewis' definition of a system of navigation (1994, p. 82), for which «the first requirements (...) is to enable the voyager to take his departure and continue towards his objective in the right direction", and Gallistel's (1990) idea for which navigation is «the process of determining and maintaining a course or trajectory from one place to another» both illustrate our perspective. The ability to maintain a trajectory in the right direction is a core component of the process involved in

approaching a destination. Indeed, in order to reach the expected destination, one needs to keep the intended route and overcome geographic obstacles. In a very similar way, the process of discourse construction also relies on the ability to identify a goal (the content the speaker intends to convey to the listener) and to construct the route and to maintain the right trajectory to express it. Like navigation in space, the flow of communication is strongly linked to difficulties in maintaining the course to reach a given destination. In fact, in the same manner as in space navigation, the achievement of the communicative goal depends on the continuous realignments implemented by speakers to rebuild the route in the face of continual digressions imposed by the different points of view typical of verbal communication (Ferretti et al., 2013). Building the route and maintaining the right trajectory to the goal is equivalent, in narrative terms, to building and maintaining the global coherence of discourse. What kind of evidence can we offer to justify the involvement of navigation systems in the processing of discourse coherence?

Recent neuropsychological and neuroimaging evidence supports the hypothesis of a connection between the systems required for spatial navigation and narrative processing in humans. For example, in Marini et al. (2008), during a story description task a group of schizophrenic participants produced derailments and errors of global coherence. This result is particularly interesting when we consider that schizophrenic patients were found to be impaired on a task in which they were required to learn their way through a virtual park rich with navigationally relevant landmarks. Similar disturbances in spatial navigation and narrative discourse processing also have been reported in persons with different aetiologies. According to Marini et al. (2010), Williams syndrome affects the narrative aspects of language. This result is particularly important given that until not long ago, the language of Williams syndrome sufferers (including discourse) was supposedly to be completely spared. Even more interesting is that Williams subjects have been reported to suffer from a severe deficit of reorientation (Lakusta et al., 2010). Even though in their 2010 paper Marini et al. did not consider the potential relationship between Williams subjects' navigational difficulties and their discourse problems, in a more recent analysis of the topic, the viability of the interpretation of Williams narrative difficulties in terms of navigational problems was openly acknowledged (Ferretti et al., 2013).

The reference to the construction of mental maps and all the processes of planning and control of one's path to a goal (O'Keefe & Nadel 1978; Spiers &

Maguire, 2006) is certainly the most intuitive way to relate spatial navigation and discourse analysis to the principle of coherence (Ferretti & Adornetti, 2011; Ferretti et al., 2013). That said, both in spatial navigation and discourse processing the ability to build the route and maintaining the right trajectory to the goal does not uniquely depend on information processing inside the mind. To figure out which kind of processing is further needed, we have to shift the focus from inner navigation to route-navigation.

5.2 Route-navigation

When we move in space, we are always looking for identified points on the ground (e.g., a church with a cross, a rock with a particular shape, a tree struck by lightning in a forest) from which we draw crucial information about our location in space and whether we are following the correct route. In fact, one of the main causes of disorientation in space is the absence of landmarks, while conversely «people typically don't get lost when in the presence of familiar landmarks» (Dudchenko, 2010, p. 66). From a neuroscientific perspective, the inability to recognize the reference points in the external world is evidenced by the "landmark agnosia" (Barrash, 1998), a specific case of "topographical disorientation" (Aguirre & D'Esposito, 1999). The role of landmarks is so important for navigation in space that even insects use them: the case of the digger wasp is one of the most studied in this respect (Collett & Collett, 2002; Duriev et al., 2003).

What makes landmarks so valuable in navigation is what Jonnson (2002) defined as their "magnetic power". In a very similar way, Nemmi et al. (2013) considered the reference points in the external world as "beacons" that attract the attention of the traveller. The idea of landmarks as beacons exemplifies the function of anchoring to the context provided by these important (external) points of reference. The landmarks (intended as the clues on the ground through which the traveller "finds confirmation" of the planned route in mental maps) are the tools that allow travellers to assess the consonance between the chosen route and the actual walking.

In *The Art of Memory*, Yates (1966) described the loci method used by ancient Greek and Roman orators to maintain their route of discourse in public debates. This method makes extensive use of the metaphor of navigation and, in particular, of the construction of (the mental representation of) specific

spaces along the route of which attractiveness plays a central role in the construction of the flow of discourse. We posit that the ancient rhetoricians offer us extraordinarily effective insights to investigate the role of landmarks in the mental processes of comprehension and production of discourse. It seems plausible that speakers' sense of route consonance and the continuous realignments and revisions in expressing their communicative intentions in the flow of speech rely on points of support characterized by a strong magnetic power analogous to what happens in route-based navigation. The construction of scenes (Hassabis & Maguire, 2007) in the critical points of the flow of speech fulfils the same function of landmarks in actual navigation (Ferretti et al., 2013).
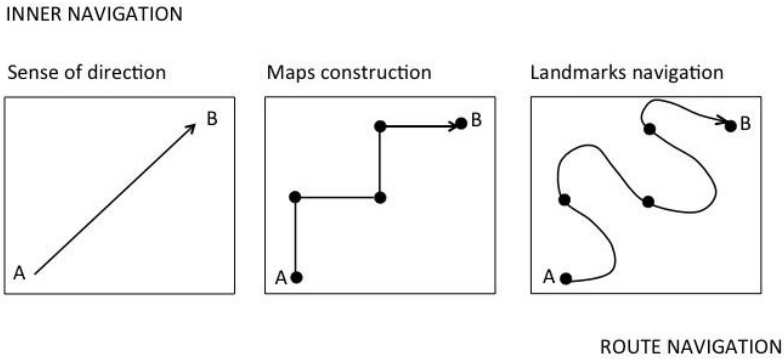
INNER NAVIGATION

Figure 1
Landmarks as point of convergence between inner navigation and route navigation.

As the relationship between the inner navigation and the human narrative abilities represents the general conceptual background of our discussion, the landmark navigation adds a further crucial step to our proposal. Looking at the landmarks in terms of the point of convergence between inner navigation and route-navigation allows us to look at the human narrative capacities in terms of the convergence between the clues model of communication and the discursive foundation of language (see Figure 1). If the identification of the goal and the recognition of the right direction to follow are useful to give an account of some aspects of discourse coherence, the landmark navigation can be profitably used to support the clues model of communication. In effect, the

specificity of such a model is closely tied to the episodic character of the expressive clues: any communicative expression of this kind is just a "prop" that occasionally occurs at a crucial point of a conversational exchange. From this point of view, expressive clues are a sort of "external scaffolding", to use Clark's (1997) terminology, through which communicators take advantage of external supports to proceed in conversation without an overly burdensome commitment in terms of elaboration processes. And it is exactly the episodic character of expressive clues that allow us to stress the close similarity between communication and route-navigation, as landmark navigation «is an episodic process» and «for landmark navigation to be accurate, one only needs to refer to the landmarks occasionally» (Yoder, Clark, & Taube, 2011, p. 561). Similar to actual navigation, expressive landmarks are useful but rather in specific and strategic points of discourse—similar to how we prop a conference with the images of power point. What evidence do we have in favour of the idea that the expressive clues used in conversational processes can be considered analogous to the use of landmarks in spatial navigation to build the right route toward a goal?

The first answer to this question comes from neuroscience. Ciaramelli (2008) reported the case of LG, a person with brain lesions at the ventromedial prefrontal and rostral anterior cingulate cortices, who invariably lost his way whenever asked to go somewhere on his own. Interpreting LG's spatial difficulties, Ciaramelli maintained that «when travelling along routes that included a location he had attended frequently in the past, LG was 'attracted' to the familiar location, and failed to reach the goal location» (Ciaramelli, 2008, p. 2103). The hypothesis of landmarks as a magnet and beacon that we mentioned before is empirically confirmed by this study. More interesting for us is that Ciaramelli established a direct connection between becoming lost in space and becoming lost in thought and language. Specifically, she suggested that LG's spatial disorientation (because of the attractive power of landmarks) involved a form of linguistic disorientation interpretable in terms of confabulation.

The second answer appeals to a different case. An interesting example to look at the role of the landmarks in the discourse construction concerns aspects of Inuktitut, one of the languages of the Barren Inuit—individuals that, because of the absence of natural landmarks in the environment around them, are continuously looking for reference points to correctly orient themselves in space (Kleinfeld, 1971, p. 132). The orientation difficulties imposed by the

environment to these individuals strongly constrains their language: for our purposes, the most interesting fact is that in communicating with each other Inuit *cannot help but* describe the location and orientation of the objects of which they speak. In this respect, an important aspect to underlying is the "contract" form (a form that fits well with the episodic character of the clues model) imposed by the "obligatory localizers" to the communicative expressions. In fact, as Kleinfleld (1971) maintains:

> Adapted to the requirements of arctic ecology, the Eskimo language codes the domain of form and location with much greater economy than the English language (Gagne, 1968). For example, Gagne (1968) points out that the three-word Eskimo sentence "ililavruk manna ilunga" would be translated into the twenty word English sentence "Please put this slender thing over there cross-wise on that end of that slender thing to which I'm pointing" to convey the same amount of information about form and location (ivi, p. 134).

Ellard (2009), in agreement with what we have argued in this paper, asserts that the use made by the Inuit trekkers of «naming landmarks and embedding them into stories», is analogous to the way in which the digger wasps use landmarks to orient themselves in space. With an important difference, however. Unlike in the case of insects, an Inuit explorer can «shift from the use of space and geometry to navigate long distance to one based on a mental landscape of words, stories, and ideas» (Ellard, 2009, p. 40). The stories told by the Inuit make a vital contribution to the orientation of individuals in an environment poor of landmarks on the ground. That said, the ability to organize space navigation through the storytelling is not the only story to tell: now it should be clear at this point of our discussion that no storytelling would be possible if spatial representation (spatial navigation, specifically) does not enter strongly in the structural organization of the stories. In our opinion, it is possible to interpret the massive use of obligatory localizers coded in Inuktitut as a living fossil of the earliest forms of expression of all human languages: the obligatory localizers that characterize the language spoken by the Inuit, in other words, are what all languages likely had at the beginning of human communication and that the Inuktitut have maintained due to the special ecological conditions in which the Inuit continue to live.

6. At the beginning, to conclude

The merit of the clues model of communication it is not only to engender the possibility of producing a convincing perspective of human language functioning, but it also to offer an interpretive outlook on the origin of our communication skills. First of all, because of the fact the clues model is able to offer a plausible explanation of how to cope with the (well-known) difficulties that affect the code model of communication with respect to the issue of origins. It is no coincidence that, from Saussure to Chomsky, the question of the origin of language has always been considered a type of reflection not worth wasting time upon: the argument underlying such a kind of reflection is that linguistic communication presupposes a shared expressive code and that such kind of code is an entity type that is given all at once or that it is not given at all. The clues model of communication allows obviating this kind of problem for the simple fact that it does not require a shared code to function.

Entrusting the origin of language to the clues model of communication means to entrust the explicative weight of the beginning of human communication to processing systems that are able to interpret expressive clues in terms of evidences of communicative intentions of the speaker. Sperber (2000; Origgi & Sperber, 2000) argues that the transition from animal communication to human language coincides with the transition from the code model to the clues model of communication governed by a mindreading system. The idea that mindreading plays a role in the origin of language is widely shared (e.g., Tomasello, 2008; Gärdenfors 2003; Seyfarth, Cheney, & Bergman 2005), and it is not questioned here. The point to be discussed here is whether the mindreading device is a sufficient condition to ensure the transition from animal communication to human language.

By the arguments brought forward to this point it should be clear that, as the narrative structure of the language cannot be interpreted in exclusive reference to the intentions of the speaker, mindreading cannot be considered the only device at the foundation of the origin of human communication. Language is strongly characterized by properties (the discursive coherence) and processing systems (the projection in space and time devices) that are very difficult to consider implicated in the functioning of communication without considering that they also are implicated in the origin of our communicative skills (see Ferretti & Adornetti, 2014). This type of analysis leads us to

consider the issue of the origin of language in reference to the protodiscursive foundation of human communication (see also Ferretti, 2013).

It is in reference to a perspective of this kind that the intent of linking the clues model of communication with the narrative perspective of language shows its explanatory power not only in reference to the issue of language functioning, but also in reference to the issue of origins. It is only through the projections in space and time, in fact, that the expressive clues produced by our ancestral relatives earn a significant distinction from animal communication. In addition to being an evidence of the communicative intention of the speaker, in fact, the expressions used in the early stages of protodiscursive communication were characterized by the projection of the clues in the narrative flow governed by coherence. If the ability to maintain the route in navigation can be seen as the condition for the construction of the flow of discourse in human communication, we have good reasons to think that the clues model (and the mindreading system strictly tied to it) must seek an ally in the navigation systems in space and time. From this order of considerations follows that the transition from the code model to the clues model is not a sufficient condition to ensure the transition from animal communication to human language. Then, we can conclude that the reasons we used to maintain that RT has to be extended in order to account for the functioning of language are the same reasons that lead us to sustain that RT needs to be extended and integrated also in order to explain the origin of language.

Conclusions

Without spatial and temporal navigation systems we would not be able to maintain the route of discourse coherence: without discourse coherence human language would be very different from how we know it today. If coherence is among the essential features of language, then it is plausible to speculate that the origin of human communication skills must have involved processing systems which included, in addition to mindreading, projection systems in space and time.

Since its inception, human communication has been strongly characterized by a narrative structure. The opportunity to transform animal communication into language was made possible by the extraordinary processing power of cognitive systems available to humans. The "sewing machine" used to construct

narrative paths through the poor expressive clues used in the earliest forms of communication is a macro cognitive device based on the conjoint functioning of three different projection systems (Mental Time Travel, Mental Space Travel and Mental Mind Travel) exaptated in order to make communication more effective than that provided by the code model. Through the projective (and visionary) power of the macro cognitive device, humans began telling stories, an ability the origin of which, as should be clear at this point, coincides with the origin of language itself. The ability to tell stories as poems or dramas (as works of verbal art) is likely beyond the conception of narrative as we used it in this paper (see Collins, 2008, 2013). But verbal art is not something qualitatively different from typical human communication. From our point of view, poetry is just the product of evolution, certainly more sophisticated and culturally articulated, of the intrinsic discursive nature of human language.

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