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Human Language: An Evolutionary Anomaly

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1. Why give away information to competitors for free?

Human beings devote a considerable share of their time, maybe one third of the day (Mehl & Pennebaker 2003:866), to sharing information with conspecifics about often futile but sometimes consequential topics. This behavior is unique in nature.[1] How can we account for the existence of honest communication in a Darwinian world where individuals are inevitably in competition with each other? The task proves much harder than what was thought in the past decades. The problem should bother all scientists, and more broadly any person wondering about human nature.

Surprisingly, asking about the origin of language within an evolutionary framework is something new. Nineteenth century positivism considered issues about human origins as belonging to metaphysics; in the twentieth century, structuralism defined language as a synchronic system, for which the temporal dimension is irrelevant; and for behaviorism, language is no more than a set of acquired habits. After isolated precursors, a decisive kick-off for the investigations of language origins occurred in 1990 when Steven Pinker and Paul Bloom published an article that drew the attention of scientists in many disciplines. Then, several international conferences were organized and a community of a few hundred scientists emerged to study the evolutionary origins of language.

The problem is challenging: it consists in understanding why human beings literally compete for offering information to whoever is ready to listen to them. How did our ancestors happen to benefit from providing information to conspecifics while still being subjected to natural selection? This was apparently new: the semantics of animal communication is generally quite poor, as the emitter does no more than praising some of its own merits or quality in a repetitive and exaggerated manner. The male nightingale can emit two hundreds or so song types that are not used to vary meaning but rather, apparently, to highlight its abilities to improvise (Hauser 1996, p. 286).

According to Darwin, the human mental capabilities differ from superior animal faculties only in degree and not qualitatively (Darwin 1871). However, as soon as those qualities have

[1] Bees communicate food source locations to their sisters in the darkness of the beehive. Contrary to bees, we willingly communicate with unrelated individuals.

been described in some detail, as cognitive sciences did during the last decades, the inverse conclusion prevails: in several respects, we differ radically from other animals. This is not so surprising, after all. All species turn out to differ qualitatively from each other, as soon as they are seriously studied. *Homo sapiens* is no exception. Which qualitative differences are we talking about in our case? Language, of course, but also other surprising characteristics like episodic memory, which stores thousands of autobiographic events (Suddendorf & Corballis 2007), selfless courage, the rites and social rules that human societies impose on themselves (Knight 2008), and so on. The explanation that will be proposed here for the emergence of language could serve as the basis for finding out why some of these other human peculiarities exist at all.

First, I will address the issue from an ethologist's perspective: human beings, in their natural habitat, use language to chat. During this strange behavior, which is wrongly regarded as futile, they build their social network. I will show how this function of chatter can explain how language can exist and be stable in a Darwininan world. In doing so, I will also mention why alternative explanations that have been proposed in the past, fail the Darwinian test.

2. Language ethology

In the first half of the twentieth century, behaviorists thoroughly observed animals kept in cages or lost in labyrinths. But we learned much less about animal behavior from these studies than from Ethology. In his works, Konrad Lorenz, the founder of Ethology, stressed the necessity of observing *spontaneous* animal behavior and of making sense of it, knowing that it is a product of natural selection. The behavior of Pavlov's dog looks very simple: the dog salivates when hearing a sound, as it was conditioned to do so. When freed from its straps, the dog however shows more interesting behavior. It behaves toward the bell or the metronome associated with reward exactly as wolf pups do when begging regurgitated food from an adult member of the pack (Lorenz 1973:121). The Darwinian function of animal behavior is unlikely to be understood under laboratory conditions where animals are forced to do what scientists expect from them. It's exactly the same for language.

Most theories about language have been abstracted from data collected under artificial conditions, such as interviews or worse, from data directly produced by the imagination of investigators who trusts their intuition about what can be said. Much more can be learned from the observation of spontaneous language, which means the chatting activity that fills up about 30% of our awake time (Mehl & Pennebaker 2003). For instance, we learn that individuals spend between 20% and 40% of their speaking time telling about real-life events. This narrative behavior, shown in all its extension by Neal Norrick (2000), is virtually absent from conversational corpora that are collected under artificial conditions. It shows up only when individuals feel at ease with interlocutors they know. Let's take an example. In the following narrative, D tells about a coincidence. She has just discovered that the colleague who sits at the next desk knows the village where she grew up perfectly well, as he spent one year of his life there (original in French).

> *D: Did I tell you about M? He is a colleague of mine; we have been sharing the same office during one year and a half. Yesterday, we were talking, he told me about his military service. He says "I did my military service in a small village, Pap... Pla... Plappeville". That's funny, we spent more than a year in the same office and yesterday, he tells me that.*

In the linguistic or sociological tradition, D's narrative behavior would be supposed to be dictated by her culture, by social conventions, by her personality, all things that are obviously variable. It is tempting to consider conversational behavior as entirely due to such contingent

determining factors. Wouldn't it be even shocking to imagine that the *content* of our chatting moments be controlled by our biology? If there were nothing specific about language in human nature, as some authors claim (Tomasello 1999a:44, 208; 1999b:526; 2003:109; Noble & Davidson 1996:214), D's behavior would be part of a purely conventional game; D would obey certain rules as she would do if she were playing chess, et those rules would be what controls her behavior. If it is how things are, it is vain to wonder about any biological determinism underlying conversational narrative behavior.

This is however what I will attempt to do. I will show that narrative behavior is indeed dictated by biological imperatives. The enterprise may seem absurd, as it amounts to negate our freedom where it seems the most obvious: in our daily chatter among friends. We will nevertheless observe that nothing, in D's narrative, is there by chance. Our ability to coin such narratives and to judge about there relevance must be part of human nature, and must have been shaped by natural selection. Before this, let's consider the other major conversational mode: argumentative discussion. Note that together, narratives and discussions may represent over 90% of spontaneous speech (Dessalles 2008a). The following excerpt has been recorded during a family gathering.

M: What was it? Is it the younger one who was crying?

N: Yes

[…]

J: We had a phase with [her brother] […] *there were nights, we slept on the couch.* […] *Every hour, I opened one eye* […] *He was awake.*

N: When he is in our bed, he does not sleep a wink during the night. He remains awake.

D: He is never... Isn't he exhausted? Well, a tired child...

L: Maybe he needs less than five hours of sleep per day?

N: But he sleeps from noon to four o'clock [pm].

L: You shouldn't allow him to sleep during the day.

N: Well, we let him sleep whenever he wants.

This example is a typical discussion in the épithymic[2] mode (Dessalles 2008a). Participants are worrying about the fact that the child does not sleep sufficiently, and they consider possible consequences or imagine tentative solutions. Did they learn during their childhood to behave that way, or does their social environment control their conversational behavior? I will try to show that the interlocutors' behavior, far from resulting exclusively from some sort of cultural conditioning, is for a good part the consequence of universal cognitive mechanisms grounded in our biology. The next move will be of course to understand how natural selection could promote such behavior.

3. Cognitive anatomy of language behavior

A precise analysis reveals that the two conversational excerpts cited above result from radically different cognitive mechanisms. Let's consider the narrative first. It is easy to see that interest in D's story relies on a few parameters.

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[2] Discussions in the *epistemic* mode deal with beliefs, whereas discussions in the *epithymic* mode involve (positive or negative) desires, as the wish that the child gets enough sleep and is not exhausted.

- D grew up in that village (Plappeville); her parents still live there; D's interlocutor (who is D's husband) knows it well.
- D's interlocutor is supposed to know about M, as D already told about him.
- M and D shared the same office.
- M and D have spent one year and a half in that office.
- M did his military service in Plappeville.
- The reported conversation with M took place the preceding day.
- Plappeville is a small village.

To study the influence of these parameters on interest, we can use a "variational" method. It consists in modifying parameters one by one to see how interest varies.

- The story would be *less* interesting if Plappeville wasn't D's native village, but a village next to it, or if her parents didn't live there any longer, or if D's interlocutor did not know about it.
- If D's interlocutor had never heard about M, the story would be *less* interesting for him. It would have been *more* interesting if M had been a close friend of him.
- If M and D were merely colleagues (without sharing an office), the story would ne *less* interesting.
- The story would be *more* interesting if M and D had shared their office during five years before noticing the coincidence.
- The story would be *less* interesting if M had spent just two weeks in Plappeville at some point in his life.
- The story would be *less* interesting if the conversation with M had taken place one week or one month earlier.
- The story would be *less* interesting if Plappeville was a city of thirty thousand people.

Such judgments about interestingness is as definite as our judgment concerning whether a given sentence is syntactically correct or not (for instance, when a foreigner speaks clumsily). We all have an intuitive knowledge of what makes stories interesting. Thanks to this ability, we can tell them, and also appreciate them. The preceding analysis reveals that these narrative capabilities involve computations, both on the narrator's side and on the listeners' side, and that these computations leave no room to chance.

Theoretical modeling shows that *unexpectedness* is a determining factor of narrative interest. Technically, a situation is unexpected if it appears less complex than expected (Dessalles 2008a, 2008b). Most situations are as complex to generate as to describe. *Generation* complexity is measured by specifying all the circumstances that allows the situation to occur; *description* complexity, on the other hand, is measured by the minimal quantity of information required to determine the situation unambiguously. Unexpected situations are simple to describe while owing their existence to a complex combination of circumstances.

Let's consider the following situation: "M did his military service in Plappeville". To generate this situation, one must choose Plappeville among all locations of similar size where M could have done his military service. The complexity of the choice depends on the number n of such locations in France. The complexity is larger when the location P (Plappeville) is small, as it makes n larger. The unexpectedness of the situation comes from the fact that "M did his

military service in P" is particularly simple to describe from D's point of view. For her, P is one of the simplest locations in the world, since she grew up there; moreover, M is a close colleague, who thus comes close to the top in the list of her acquaintances; lastly, the military service is a unique period in one's life, and it is simple once M is specified. Unexpectedness results from the contrast between the complexity of generation and the complexity of description. The parameters that control interestingness are those that influence the contrast: the size of the village, its psychological proximity, the colleague's closeness, the fact that it was the military service instead of an ordinary stay. Even the temporal proximity of the reported conversation between M and D matters, as it makes the event less complex to describe (Dessalles 2008a, 2008b).[3]

When noticing the systematic sensitivity of humans to unexpectedness, ethologists must have two concerns. First, in what way does the ability to detect abnormally simple situations confer a benefit to individuals within the species? Second, why spend time and energy in signaling those situations to conspecifics? Before attempting to answer, let's ask similar questions about argumentative discussion behavior.

The discussion between J, N, D and L about the non-sleeping child is typical of the argumentative behavior that is observed in our species. Argumentative discussion, as previously said, takes up a significant part of our available time. It can be modeled as an alternation between two quite specific attitudes: signaling a contradiction, and attempting to resolve it. Let's observe in detail how D, L et N adopt these attitudes in the example.

Contradiction 1 (D):

- The child is tired (because he does not sleep enough)
- That a child be tired is undesirable

Solution (L): the child is not tired, because he does not need much sleep

Solution (N): the child is not tired, because he sleeps from noon to four o'clock.

Contradiction 2:

- The child does not sleep during the night
- That the child sleep during the night is desirable

Solution (L): the child will sleep during the night if he is not allowed to sleep during the day

Contradiction 3 (N):

- The child is not allowed to sleep during the day
- The child wishes to sleep during the day

In this discussion, as in all argumentative discussions (Dessalles 2008a), contradictions and tentative solutions alternate. The game is heavily constrained. Any other conversational move would be perceived as irrelevant. When observing this remarkable behavior, ethologists must have two concerns. First, in what way does the ability to detect contradictions or to resolve them confer a benefit to individuals within the species? Second, why spend time and energy

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[3] The duration of M and D's sharing of the same office, besides the fact that it makes M closer and thus simpler, is an independent source of unexpectedness. D declared later: "That's strange, we spent all that time sitting one in front of the other, without knowing that we had that in common." According to D, it is hard to generate so long a co-presence without the common proximity with Plappeville being ever mentioned during their numerous conversations.

in signaling those contradictions or solutions to conspecifics? The first answers that come to mind may not be the correct ones.

4. Why are we talking? Famous non-Darwinian explanations

4.1. The so-called adaptive "virtues" of language

Many authors consider the very existence of language as hardly problematic. Some of them, among the most renowned, suggest that our species acquired the biological predisposition for language fortuitously and in the absence of selection pressure (Chomsky 1975:58-59; Piattelli-Palmarini 1989; Hauser, Chomsky & Fitch 2002:1573). This position is mostly surprising, as human language bears all the hallmarks of adaptation (Hauser & Fitch 2003; Fitch 2004), if only its complex structure (Pinker & Bloom 1990). Noam Chomsky anti-adaptive position makes sense if the emergence of language is regarded from a macro-evolutionary perspective (Dessalles 2000). As Stephen Gould (1996) showed, evolution at that scale seems to be governed by chance exclusively. The advent of the language faculty in our lineage is, from that perspective, certainly fortuitous and does not correspond to any kind of evolutionary trend. However, one should not conclude from there that Evolutionary Theory has nothing to say about the nature of language, as Chomsky claims (1975).

Evolution through natural selection generates local adaptations: what is advantageous in the context of a given species is unlikely to be advantageous for individuals of another species. Each species is located in an adaptive niche. A local optimum within this niche is rapidly reached thanks to the combined actions of natural selection and genetic mixing. The relatively high speed of selective mechanisms has two consequences (Dessalles 2000). First, non-trivial characteristics result from local adaptations. They are locally optimal for their function. Second, species are, most of the time, in equilibrium and are not submitted to any selection pressure (Eldredge & Gould 1972). Chomsky is thus correct when he claims that the evolutionary emergence of language was unpredictable. Its existence is nevertheless due to the fact that it fulfils a Darwinian function, as any other non-trivial characteristics of living beings. This means that it benefits individuals endowed with it. But which function are we talking about?

Obviously, supply is not lacking. Many authors even see in language an *obvious* (Lieberman 1992:23; Bickerton 1990:156; Pinker & Bloom 1990:712; Pinker 1994:367; Blackmore 1999:99; Nowak & Komarova 2001; Ritt 2004:2), *considerable* (Savage-Rumbaugh & Lewin 1994:249) ou *huge* (Chomsky 2002:148; Penn & Holyoak & Povinelli, 2008:123) asset. What does this obvious, considerable or huge asset consist in? Some authors invoke a combination of several general-purpose functions (Fitch, Hauser & Chomsky 2005:189; Szathmáry & Számadó 2008). Lieberman (2003:19) goes so far as considering as futile, if not silly, to attempt to find "the" factor that provided the selective advantage for the evolution of human linguistic ability. The picture drawn by all these authors is this: a complex faculty, language, adorned with a variety of selective values. Strangely enough, none of these virtues did have any selective effect in other species. Let's examine what these merits of language are claimed to consist of.

Most reconstructions of the first stages of the evolution of language mention the practical benefits that such a communication means could bring to naked hominins[4] that had to confront a supposedly ruthless environment. Some mention more efficient hunting, due to better coordination of action (Jaynes 1976:133; Bradshaw 2001:66; Snowdon 2001:226;

[4] Hominins are all species of our lineage that lived after the last common ancestor with chimpanzees.

Szathmáry & Számadó 2008); others refer to the possibility of warning against predators or of indicating food sources (Lieberman 1992:23; Bradshaw 1997:100-101; 2001:66; Snowdon 2001:226; Bickerton 1990:146; 1995:104; 2002:209; 2003:84). The convincing force of these "explanations" relies on one hypothesis that is supposed to explain why language has been positively selected: information sharing within a group would benefit the whole group, and the communicating group would prevail over non-communicating groups (Allott 1989; Györi 1997:46, 47; Goodson 2003:74; Castro, Medina & Toro 2004:734; Ritt 2004:1-2; Hurford 2007:330). Another supposed advantage of language that may explain its emergence through natural selection is sometimes invoked: language would improve the pedagogy of stone tool manufacturing (Lieberman 1992:23) and more generally the transmission of experience from parents to offspring (Bickerton 2002:221; Fitch 2004; Castro, Medina & Toro 2004:725). Those various hypotheses have two major flaws that we examine now.

4.2. The so-called "pre-adaptations"

The first difficulty that undermines the preceding hypotheses is that they do not, at face value, apply exclusively to our species. If the above mentioned type of reasoning were correct, many other species would "gain" from communicating during hunting or would "gain" from sharing knowledge within the group or within families. Why are humans (or their immediate predecessors) the only ones that enjoy these benefits? Authors who stick to practical advantage of language to explain its emergence are forced to non-parsimonious lines of reasoning. Standard thinking in evolutionary sciences consists in finding tentative explanations of species modifications by changes in biological, ecological or behavioral niches. In the case of language, many authors strive instead to find out what could "prevent" *all other species* from evolving language. It would be the inability to manipulate symbols (Deacon 1997), the inability to master joint attention (Tomasello 1999a), the inability to imitate (Donald 1998; Arbib 2005), the inability to represent others' thoughts and intentions (Sperber & Origgi 2005), the inability to master recursive syntax (Bickerton 1995:120; Hauser, Chomsky & Fitch 2002), the inability to manage cooperation (Gärdenfors 2004; Hurford 2007:304), the inability to master concepts (Schoenemann 2005) or the inability to elaborate plans (Gärdenfors & Warglien 2006).

Explaining language, for these authors, amounts to discovering the « pre-adaptations » that « allowed » language to emerge. There would be a wide-ranging selection pressure for useful practical communication, but evolution through natural selection would have been short of inventiveness or of time to produce the necessary prerequisites (symbols, joint attention, imitation, theory of mind, recursion, cooperation, concepts, plans, and so on). Such thinking is, however, at odds with contemporary evolutionary theories (Gould, 1996) supported by calculus and simulation (Dessalles 1996). When they are under selection pressure, species evolve until they reach an equilibrium where selection pressure vanishes or where several selection pressures cancel each other out. The argument that nature would "lack imagination" to respond to some local selection pressure is supported neither by evolutionary theory nor by existing data. Moreover, evolution in presence of selection pressure is a rapid phenomenon (about hundreds of generations), what refutes arguments claiming that evolving our communication form would require prohibitive time (de Duve 1995:403; Worden 1998:150).

At the outset, communicating information requires nothing complicated. It can start with a simple gesture. Declarative pointing is systematic in our species, which differs from others in this respect (Tomasello 2006). As adult do, human infants systematically signal novelty as soon as by one year of age (Carpenter, Nagell & Tomasello 1998). Seeking out various limitations that could have "hindered" the evolution of declarative pointing in such and such species would be absurd. If other species do not have this form of declarative pointing, it is by

no means because they "cannot" achieve it. Selection pressure towards such behavior simply does not exist. We must therefore account for the existence of language in our species, and not for its absence in other species.

4.3. Utility arguments

Those who consider language as endowed with a variety of virtues, and see in those virtues as many reasons of its evolutionary emergence, must face another problem. All the above mentioned benefits brought by language (more efficient hunting, finding food sources, pedagogy, and the like) are benefical to the collectivity, or to listeners, but never to speakers. The latter offer information that may be useful first to addressees, and then to the whole community. Not only do they devote time and energy to giving information for free, but they loose the exclusivity of that information (think of food source location, in Bickerton's account). These benefits granted to others are in no way a Darwinian explanation. Among the authors who are aware of the problem, some invoke group selection or cooperation.

In first approximation, group selection does not exist. Contrary to what certain popular versions of Darwinian Theory have led some to believe by using phrases like "for the good of the species", the ecological fate of the species or of the group doesn't change the proportion of genetic variants (Williams 1966). The natural selection mechanism relies on the differential reproduction of individuals *within* the species or the group. If individuals in a group communicate in a useful way, this group is readily believed to thrive more than another group in which communication would be less efficient or lacking. This, however, tells nothing about the evolution of communication, because information exchanged in the first group benefit all its members, including those who take information and do not give any. In the following generation, the proportion of individuals ready to communicate will not have changed.

It is true that some group-selectionist mechanism does exist in theory. In practice, its conditions of validity are particularly restrictive (Sober & Wilson 1998:26), and they have no chance to apply to language. Groups should be relatively isolated, but still in competition; they have to differ significantly in the characteristic in question, which means that communication should be intense in some groups and low in others; the ecological success of groups must be highly correlated to the communication level; lastly, individuals have to migrate among groups to propagate communication behavior. These hypotheses are at odds with our ecology. Exogamy tends to homogenize group composition in social primate species. The correlation between language use and ecological success seems also to be refuted by facts: the ecological success of our species occurred long after the advent of language, since it dates from settlement (12 000 years before present). The density of hunter-gatherers societies is not significantly different from the density of other primate species (Ray 2003). Last, group selection can at best account for the persistence of a minority variant within a population, due to the hypothesis concerning group disparity. It cannot explain the emergence of a generalized propensity like our language behavior.

The other great argument that links the alleged usefulness of language to its positive selection invokes cooperation (Calvin & Bickerton 2000:123; Pinker 2003:28; Nowak & Sigmund 2005:1293; Nowak 2006:1561; Gärdenfors 2004; Hurford 2007:304). What A gives to B may be recovered by A in the future, if only B reciprocates. In this metaphor, language use is compared with information barter. Cooperation may work, but one more time only under restrictive conditions which do not apply to language (Dessalles 1999): high benefit-to-cost ratio and efficient detection of uncooperative individuals. In contrast with these requirements, human conversation is often about utterly futile topics which have no impact on individuals' survival. Moreover, speech is generally public: individuals most often talk to

several people at a time (Dunbar, Duncan & Nettle 1995), what makes any control of future reciprocity almost impossible. Cooperation predicts highly utilitarian conversations, utterances resembling cautious whispering and a constant prompting of information holders by those who are in need of information. In other words, cooperation predicts the exact opposite of spontaneous language as it can be observed (Miller 2000, p. 350).

Collective or cooperative models not only have a hard time explaining what benefit language brings to speakers, but they are also helpless with the fact that selection pressures were stronger on the speaker's side than on the listener's side. Our auditory capabilities have not significantly changed to adapt to language, as illustrated by the fact that a variety of species can be trained to discriminate linguistic phonemes (Toro, Trobalon & Sebastián-Gallés, 2005). By contrast, phonatory organs have been radically transformed, with a pharynx located as low as at the sixth vertebra. If language had a crucial utilitarian value, we would have evolved trumpet-shaped ears to steal words that are not aimed at us (Miller 2000). On the contrary, conversations are a competitive arena where speakers compete with each other. Instead of taking advantage of this informational godsend, listeners overtly evaluate what is said to them (Dessalles 2000). All these facts leave little doubt that language evolved under selection pressure acting primarily on speakers. In what follows, we show how language could evolve to the advantage of to those who use it.

5. The speaker's advantage

Nature offers countless examples of signals. In most situations, the signaler's benefit appears clearly. However, in some situations such as alarm calls, the explanation is not obvious. When warning of approaching predators, the signaler also draws the predator's attention to its own presence, what seems an absurd strategy. Alarm calls could result from the kin section mechanism: in black and white colobus (*Colobus guereza*), only dominant males emit alarm calls, supposedly to protect their own offspring. Alarm calls may be also a product of sexual selection: in Diana monkeys (*Cercopithecus diana*), females seem to favor males that are able to produce costly alarm calls in the presence of a predator (Zuberbühler 2006:145). Alarm calls could also benefit the caller as the ensuing panic may thwart the predator's hunting strategy.

The second explanation should hold our attention here (we may forget that it is about sexual selection). Signalers take a situation, the presence of a predator, as an excuse to show off a quality, namely that they are good sentinels. The idea of "signal as display" lies at the core of Handicap Theory (Zahavi & Zahavi 1997). According to Amotz Zahavi, if birds put their lives at risk when mobbing a predator, as when they circle around a snake, it is to display their courage and get prestige (Zahavi & Zahavi 1997:144). Before rejecting his interpretation as anthropomorphic, we must observe that finding a Darwinian explanation of bird mobbing is not easy. A face value, the best strategy to survive should be to let other birds mob, while carefully avoiding pointless risks. The Zahavian explanation about the pursuit of prestige holds if birds benefit from being regarded as courageous by conspecifics. In babblers (*Turdoides squamiceps*), long-term survival crucially depends on the ability to occupy a bush, as it represents a shelter against flying predators. The true enemy of babblers is not the predator (these little birds may live several decades when protected in a bush), but other coalitions of babblers which are eager for seizing their bush. It makes sense, therefore, for a babbler to seek for courageous individuals that are ready to defend the common bush efficiently. As a consequence, since courage is highly valued in the babbler society, it makes sense also to display it on each opportunity. Mobbing is thus, according to this logic, an instance of social display.

The digression about babblers is not irrelevant. My claim is that *language is a form of social display*. Contrary to utilitarian theories of language, in which information is considered as a tangible good that has direct effect on survival, the social display theory predicts that the content of utterances can be inconsequential. The purpose of conversational utterances is to demonstrate a socially valued quality, and what we talk about when speaking is nothing else but a means to this end. This hypothesis leads to a consistent Darwinian schema (Dessalles 1999; Gintis, Smith & Bowles 2001), since both the emitter and the receiver of the signal get something out of it. The receiver gets the opportunity of gauging the emitter's quality, whereas the emitter pushes forward his/her performance in regard to the quality in demand. What's more, it explains why signalers are competing with each other, since it is their only chance of being socially accepted. For this schema to apply to human language, two questions must be answered: Which quality is displayed through language? Why does this quality get socially valued? A satisfactory answer to these two questions will give us the first Darwinian explanation of the existence of language that does not neglect the fact that language should benefit to those who talk.

6. The role of information in hominin politics

The human species has a specialty of its own: politics. We are not the only ones. Chimpanzees form coalitions to gain influence over the group or to resist the power of others (de Waal 1982); babblers form coalitions to hold bushes (Zahavi & Zahavi 1997); dolphins also form coalitions, and even coalitions of coalitions (Connor, Heithaus & Barre 1999). Human beings are not merely living in groups or in families. Individuals make up *social networks* by recruiting each other as friends. These social networks have been at all times crucial for the survival and the success of their members. In the absence of police and justice, those who have no friends are just right to be the victims of those who do have ones. Understandably, human beings, as other primates, devote considerable time to recruiting reliable friends. Language obviously plays a crucial role in this process, but which?

In a celebrated book, Robin Dunbar (1996) suggested that the way human beings use language looks similar to the grooming behavior of primates. In doing so, he reminded scientists of the primarily social role of language which, like grooming, is essential for the establishment and the preservation of social bonds. This observation is however insufficient when it comes to explaining how conversational behavior as we know it, with its narratives and its argumentative discussions, came to play such a role in our lineage.[5]

To understand why language does exist at all, we must first realize how original human politics is. Our ancestors' political organization has been suddenly disrupted when one hominin species discovered the use of lethal weapons such as stones and spears. Dating this revolution is not easy. It could correspond to the advent of bipedy. The benefits of this locomotion mode are still poorly understood (Berge & Gasc 2003:124). Its function could be to allow hominins to carry their weapons. A bipedal being can use its hands to transport a spear, an absolute necessity when other individuals are themselves armed. Whatever the date, the advent of weapons use totally disorganized the previous political order, as it allows any individual to kill any other individual at no risk, for instance during the victim's sleep (Woodburn 1982:436). Murder within the group does exist in chimpanzees, but it is rare and involves risks for the perpetrators (Reynolds 2005:162). Understandably, the use of weapons

[5] Dunbar offers his own explanations. Human conversation involves a significant part of gossip. This, in Dunbar's conception of human social organization, justifies the existence of language as a way to deter uncooperative individuals. I do not consider these arguments here.

suddenly turned traditional primate dominance, which is essentially based on physical strength, upside down. In what way did it change?

The most elementary way to protect oneself when weapons are available in a community and in the absence of institutional policing consists in being vigilant towards other members of the group. This of course cannot be enough. The next step consists in putting vigilance capabilities in common among reliable friends. As a consequence, coalitions are no longer based on physical strength. Ideal friends, all things being equal, are individuals who show the best abilities in detecting threat. In this model, language emerged as a response to absolute insecurity due to weapon use (Dessalles 2008a). Let's briefly examine the consequences of this scenario.

Here are the different steps, as one can reconstruct them plausibly (Dessalles 2000). In this new insecurity context, individuals show off their quality in detecting danger by signaling any novelty, using a mere pointing gesture. This novelty-oriented "here-and-now" form of communication does not require complex cognitive capacities, contrary to what is sometimes believed (Tomasello 1999a). By demonstrating that they could see before the others, individuals exhibit their quality as potential allies and therefore increase their social value. The behavior which consists in signaling unexpected events, as illustrated in the conversation about Plappeville, is deeply rooted in this elementary novelty-oriented pointing. The complexity drop that characterizes unexpectedness (Dessalles 2008b) is a good indication that some new structure is present in the environment, and this correlates with danger. Nature seems to have discovered this correlation, in a context where danger essentially comes from group mates. By taking every opportunity to signal abnormally simple events, individuals demonstrate their vigilance.

In a next step, which remains hypothetical, communication reached a stage where individuals signaled "almost-here-and-almost-there" events. This possibility increased the number of opportunities in which signalers could show that they were first to know. This new form of communication corresponds to protolanguage (Bickerton 1990). Protolanguage is a communication mode in which words are concatenated without syntax. A proto-sentence like "strangers–plain–fire" may evoke, in an appropriate context, the presence of strangers making fire in the plain (Dessalles 2008a). This transition to a new form of expression requires a new cognitive capacity, since individuals must be able to combine the concrete meanings evoked by the words of the proto-phrase (Dessalles 2000).

The third and last step corresponds to the emergence of language as it is universally used in our species. This step is characterized by the emergence of the argumentative behavior, as illustrated in the example about the non-sleeping child. What is the primary function of argumentative discussion? A plausible hypothesis is that it allows to cast doubt on others' stories. An argument can destroy the interest of a news by showing that the news is false or exaggerated. The transition from protolanguage to our form of language thus receives a Darwinian explanation: argumentation possibly emerged as an anti-liar device (Dessalles 1998, 2008a).

Once installed, the argumentative faculty liberates speakers from immediacy. In previous stages, any signaled event had to be checked with one's own eyes to give the speaker credit for it. Thanks to their argumentative ability, interlocutors can appraise the relevance of others' stories by checking their logical consistency. Anyone who lies or exaggerates when reporting an event puts herself/himself at risk of being publicly exposed as a liar. This new checking device opens up a broader range to communication. Individuals can now report events that are distant in time and space, and are thus unverifiable. Such reports, thanks to the new argumentative faculty, get a new value that did not exist in the preceding stages.

In this evolutionary scenario, the transition to the argumentative capacity is made possible by a new cognitive capacity, *negation*. Human beings, contrary to their forebears, are able to project binary distinctions onto perceptive oppositions which, by nature, are gradual. A human being can express for instance the fact that a given object is, or is not, edible, or the fact that a given individual is, or is not, a stranger. The distinction between the individuals one can marry or cannot marry, which is as binary as the preceding ones, led to radical modifications in the organization of our societies in our species (Knight 1991).

The third stage, characterized by the use of full language, is also remarkable by the use of syntax. Why do all humans subject themselves to using constraining grammars? Grammar allows to express with precision what logicians name *predicates*, in other words relations like "*x* has property *P*" or "*x* did *A* to *y*". While words of protolanguage are bound to evoke concrete scenes, words of language refer to relations. This radical change is also due to the advent of argumentation. An image or a scene cannot be negated. One can get an image of an apple, but not of a "non-apple". But one understands easily what "*x* does not have property *P*" or "*x* did not do *A* to *y*" mean. Relations, because they can be negated, are the atoms of argumentation. The syntactic faculty of human beings is thus given a function, which is to allow the expression of relations (Dessalles 2000).

7. Conclusion

The main objective of this chapter was to show that language presents a problem for Evolution Theory. The fact that individuals repeatedly compete with each other to offer information to conspecifics is a property of language that cannot be easily explained away by vague considerations about the listeners' benefits. To explain the *speakers'* advantage, we took into account the political dimension of the human social organization. When forming coalitions, individuals choose each other according to certain criteria. To attract new friends or to keep one's current friends, one must display qualities that are socially in demand. I drew attention to the fact that since the invention of lethal weapons, signaling unexpected events became socially valued, as it correlates with the ability to anticipate danger. Language would thus originally come from the generalization of an alert behavior. The merit of this model is to reintegrate language into the standard framework of natural science, namely Darwinian Theory.

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