Language and Hominid Politics

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1. Introduction: the language gap

Language is the main distinctive feature of our species. Why do we feel the urge to communicate with our fellows, and why is this form of communication, characterised by *relevance*, unique in animal kingdom ? In this chapter, we will first stress this specificity of human communication. In a second part, using computer evolutionary simulations, we will dismiss the usual claim that human communication is a specific form of reciprocal cooperation. A Darwinian account of language requires that we find a selective advantage in the communication act. We will propose, in the third part of this chapter, that such an advantage can be found if we consider language activity in the broader frame of human social organisation. In the continuation of the 'chimpanzee politics' studied by de Waal (1982), the ability to form large coalitions must have been an essential feature of hominid societies (Dunbar 1996). We will suggest that relevant speech originated in this context, as a way for individuals to select each other to form alliances.

1.1. Uniqueness of relevant speech

The way we communicate is unique among animal species. Not only because we make use of sophisticated syntax, not only because our symbolic abilities allow for complex semantics, but also because our speech is and must be 'relevant'. Relevance, as defined in (Dessalles 1993; 1998), is a precise requirement that strongly restricts what is acceptable in human conversation. By human conversational standards, most messages exchanged in animal communication are 'boring': repetitive territorial signalling, individual identification, systematic threat displays cannot be considered as genuine conversation. We expect from human speakers that they bring novelty, perform sound reasoning or raise important issues. Being immersed in relevant speech, we fail to recognise how peculiar the communicative behaviour of our species is. Human

conversation can be seen as a game, in which something is to be won or lost. Think of how easily one may become ridiculous when uttering a dull remark, especially if there is a large audience. People who repeatedly fail to make relevant points are likely to be considered mentally defective. Conversely, people having the ability to make sound statements or interesting moves on certain subjects are likely to become the focal point of the conversational group. From such a perspective, language appears more as a kind of 'sport' than as a way to convey information. We may consider it an idiosyncratic peculiarity of our genus that occurred by accident.

It is not, of course, the usual way to consider linguistic ability. Language indeed confers an extraordinary advantage to human groups. Speaking individuals share information and knowledge, they can coordinate the group's actions efficiently, they can keep track of important events. Thanks to language, factual knowledge, innovation and memory become collective, extending their power well beyond the capabilities of single individuals. It is thus natural to consider language as such an improvement that every species would gain from possessing it. In practice, only one species succeeded in developing language as we know it, but many are on the path leading to this remarkable achievement. In this anthropocentric scenario, species like chimpanzees or gorillas are considered as staying at the edge of the Promised Linguistic Land. Their backwardness would merely result from quantitative limitations: they are not clever enough to manipulate abstract concepts, or their brain is not large enough to hold a sufficiently large vocabulary. This is not, however, the scenario we advocate.

Such accounts of language origin, which rely on quantitative factors to explain our distinctive communicative performance, fail to explain human language uniqueness. Did other primate species not have enough 'time' to evolve symbolic thinking and language ? There is no support for such a hypothesis. On the contrary, descriptions of evolution as a punctuated process (Gould & Eldredge 1977; Dessalles 1996) suggest that evolution is a rapid process. The underlying mechanism, called implicit parallelism by Holland (Holland 1975; Goldberg 1989) is used in computer optimisation for its rapidity. The fact that genes are selected in parallel is not considered by those evolutionary accounts which insist on evolutionary speed limits (Worden 1998). Thanks to the rapidity of evolutionary changes, species stay most of the time in equilibrium. They occupy different adaptive local optima and thus differ qualitatively. Following Monod (1970), we consider that language, at least in some primitive form, contributed to make such a qualitative difference between apes and early hominids.

1.2. Linguistic relevance and biological relevance

The kind of content exchanged during conversation is not mere information. As Wärneryd (Wärneryd 1994:407) states: "If we encounter people walking around uttering

arbitrary true statements about the state of the world for no particular reason other than telling the truth, we will probably think of them as being insane". In (Dessalles 1993), we give a definition of conversational relevance: in order to be relevant, *i.e.* acceptable in a conversation, a new topic must be either about an unusual state of affairs or present some stake. Facts or events that can be recognised as improbable, paradoxical, undesirable or desirable are thus relevant. We say that they bring conversational information. "I damaged my neighbour's brand new car with my ladder" may be said to friends, because they will worry about the consequences. In the utterance "I found a tiny medallion I lost last year in the forest" , friends may recognise a very unlikely, 'unbelievable' event and may be interested. However, one will not say "Jack lost a one pound coin last year" or tell stories like "I woke up this morning, I took a shower, I dressed; then I had breakfast and listened to the news". Being neither unusual nor (un)desirable, such events do not bring sufficient conversational information and will not be accepted as conversation topics.

This phenomenon should not be considered as merely anecdotal. Whenever people are brought together, their attention is focused on finding something worth saying. If they fail, they would rather remain silent than utter a platitude. The task is indeed not trivial. Because most of us are expert in thinking up relevant utterances[i], we fail to appreciate it at its true value. Finding some event in the environment or in recent memories that will bring much conversational information requires sophisticated cognitive abilities. The event must be perceived as particularly unusual by addressees or should appear as strongly positive or negative. Such topics are, by definition, not easy to find. Admittedly, the relevance threshold varies according to the social context. Making an interesting statement is much easier when talking to one's best friend than when addressing a large group. In the latter case, we devote all our attention to the task.

This demanding role is acted in the addressees' interest. The knowledge we require in order to survive and prosper in human societies is learned mostly through conversation, and only for a minor part from direct experience. We may recall the fate of deaf children who have no access to sign language. Deprived of the experience that other people offer in context during conversation, they become socially maladjusted. What conversationalists make available is not simply information ; it is *relevant* information. Relevant information is more likely to be useful (Dessalles 1998): biologically significant events are often unusual, or positive or negative, while events which are both common and neutral have no reason to attract attention. In other words, conversational relevance is a good indicator of biological relevance.

If conversational information is so useful, we may wonder why speakers make every effort to offer it for free. Let us consider first the possibility that such behaviour is based on symmetrical cooperation between individuals.

2. Beyond symmetrical cooperation

The fact that human language relies on symmetrical cooperation between individuals seems obvious. Conversation, which is the most common and universal use of language, involves participants who alternate linguistic moves. Participants, as stated by Grice (1975), give each other the reliable, clear and relevant information needed to understand the intended meaning. Conversation, which relies on such solicitude, must be one of our most cooperative behaviours. Speakers bring only the required amount of information to be clear and avoid being redundant. Then roles are inverted and the game continues further. We wish however to offer a different, perhaps counter-intuitive, picture of what is going on in linguistic exchange. We will suggest that there is no more cooperation there than between a figure skater and her judges. Both sides agree to play according to precise rules, but pursue quite different goals. One may wonder why interlocutors exchange roles, if not to insure symmetrical cooperation. Besides the fact that such symmetry is far from systematic, we will consider another account for this alternation.

2.1. Evolution of symmetrical cooperation

Cooperation is generally claimed to be a powerful means to improve the viability of individuals. It is often believed to be a main cause of human sociality and of language (Wilson 1978). A natural hypothesis concerning language is that it is based on reciprocation: A gives valuable information to B because B will give valuable information to A in return. This seems to be the obvious reason why conversation, this strange alternation of communicative moves, exists at all. Likewise, social bonds, friendship, the ability to coordinate collective action and altruistic acts would all result from the same ability to engage in inter-individual cooperative games (Wilson 1978). There are, however, several problems with symmetrical cooperation. One of them is that it may collapse in the presence of 'cheaters', who may benefit from the first move while failing to reciprocate. In the case of language, the presence of pure listeners is indeed a problem for the cooperation theory. Relevant speech has a cost: providers of information must spend time and energy finding interesting topics. If relevant conversational information is fruitlessly given to pure listeners, it is not only a waste of time and energy, but also a way of helping potential genetic competitors (Dessalles 1998). We should thus predict the disappearance of communicators.

A possible defence against pure listeners is for speakers to memorise who cooperates and who does not. Then they talk selectively to responsive individuals. This strategy is not absolutely safe, though. To illustrate the problem, let us

consider the simulation of figures 1-3. In this simulation, a population of 500 individuals is evolving. They mate, reproduce and eventually die after a few 'years' or because their 'vitality' becomes too low. After reproduction, ageing and random accidents decrease vitality and cause deaths until the population comes back to 500 individuals. Two genes, C and R, are introduced in the population. These genes are at different positions on the genome, so that each individual may carry both, or only one of them, or none. When an individual carries C, it chooses a fellow and gives it valuable information, which is translated into vitality points. If this second individual carries R, it gives information back. Each of these behaviours has a cost, but both individuals eventually benefit from the cooperation. Of course, if the addressee is not an R-carrier, it remains unresponsive ; it benefits from the information given while bearing no cost, and the speaker has lost its time. Under such conditions, R-carriers tend to be rare, which causes C-carriers to die out (figure 1).
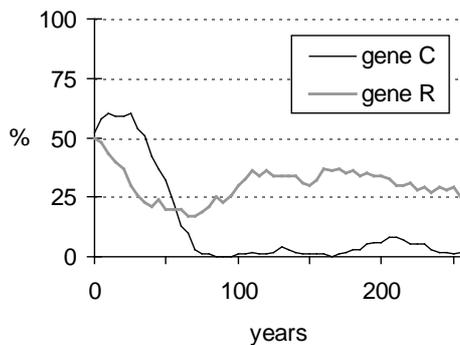

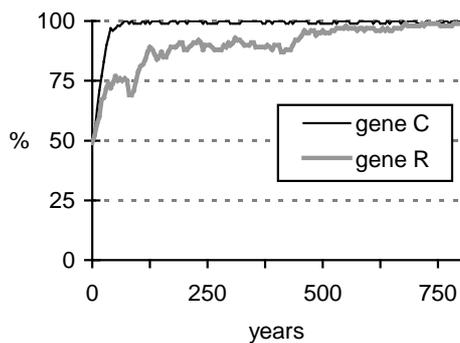Figure 1: basic simulation of cooperation

Figure 2: favourable cooperation with 'marking'

There have been many attempts to stabilise the evolution of cooperative strategies by introducing cheating detection (Axelrod 1984, Frean 1996, Ferriere & Michod 1996, Nakamaru et al. 1997, Macy & Skvoretz
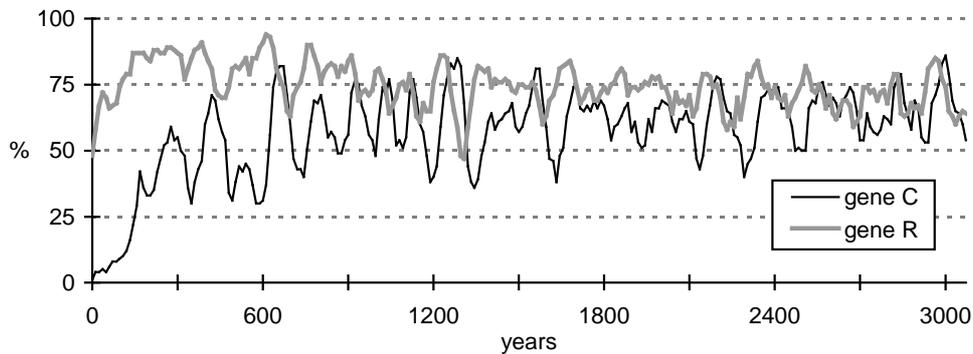
Figure 3: typical cooperation with 'marking'

1998). When no retaliation is possible in case of cheating, the basic idea is to diminish the relative importance of the random first step, and thus to increase the reliability of subsequent moves, by directing them exclusively toward responsive individuals. In the simulations of figures 2 and 3, individuals 'mark' responsive individuals in order to preferentially talk to them in subsequent trials. We observe the evolution of the frequency of each strategy in the population over time. Results crucially depend on the value of some parameters: the profit made when receiving information, the cost of producing information, the efficiency of 'marking' responsive individuals. For a very broad range of these parameters, we observe oscillations (figure 3). Oscillations are due to the fact that speakers have no way to discriminate unresponsive individuals in their first trial. If speakers are numerous[ii], there is much profit to be had by remaining unresponsive and waiting to be chosen by chance. Consequently, the frequency of respondents, and the frequency of speakers, tend to decrease. Conversely, when responsive individuals are rare, they take advantage from being repeatedly chosen for cooperation. They begin to increase in frequency, and speakers as well. These cross-effects explain why frequencies tend to widely fluctuate over time.

This simulation may help us to determine whether symmetrical cooperation can be the key explanation of the evolution of communication. The situation of figure 3 is not dynamically stable. It is not appropriate for the evolution of complex faculties, because it does not create any selection pressure. To verify this fact, we introduced two versions of each gene in the simulation. C1 and C2 are communication genes. Both induce their carrier to initiate communicative acts. With C1, however, the speaker gives only a fraction of the information it would have conveyed with C2. Similarly, R1-carriers give only a fraction of what R2-carriers return to the speaker. If the cooperative scenario were a sound explanation of the origin of communication, we would expect selection pressures
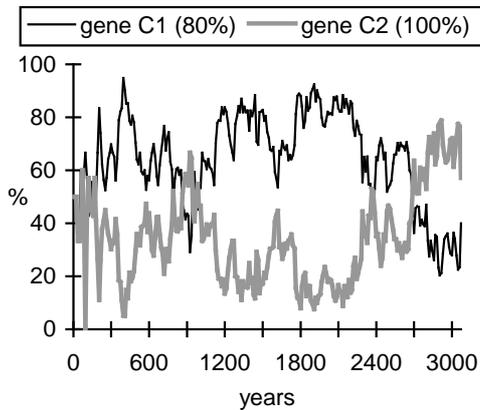
Figure 4: relative proportions of two alleles of gene C. C1-carriers invest 80% of what C2-carriers invest in communication.
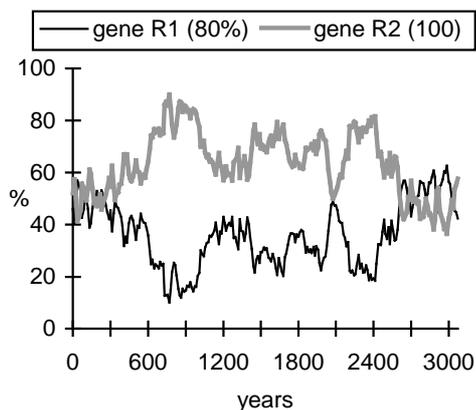

Figure 5: relative proportions of two alleles of gene R. R1-carriers return 80% of what R2-carriers return to communicators.

leading to a clear dominance of C2 and R2 over C1 and R1 respectively. All the sophisticated features of language, the ability to convey about ten phonemes per second, to use complex syntax including recursive structures, case marking and agreement, the existence of a complex conceptual semantics and the ability to control relevance were not given to humans by accident. There must have been a strong selection pressure leading to linguistic abilities allowing greater precision and an increased expressing power. Can we reproduce such a selection pressure in our simple simulation ? The answer is no. Figure 4 shows that no clear domination between alleles C1 and C2 is to be observed. Figure 5 shows a similar negative result for alleles R1 and R2. Comparable results have been obtained for iterated cooperation: when individuals can choose intermediate levels of cooperation, several strategies coexist (Frean 1996).

The situation illustrated figure 2 seems more promising. It is however obtained for particular values of parameters: high payoffs, low costs and reliable cheater discrimination. These three favourable characteristics are needed to obtain dynamic stability and thus to enable selection pressure. Unfortunately, human communication matches none of these three requirements. Most of the time, it does not provide any significant payoff. Even if acquiring information is profitable in the long run, immediate benefits are far from being guaranteed. Are the costs associated with language especially low ? Talk is sometimes said to be a 'cheap' activity. We stressed however the fact that being relevant requires all our cognitive resources and presupposes a lot of time for acquiring information. This is not a negligible cost. Lastly, it is not the case that speakers perform any efficient cheating detection, as we will see now.

2.2. Inverse cheat detection

The immediate prediction of a model of communication based on symmetrical cooperation is that cheating detection is performed by speakers, who have to be confident in the fact that addressees will reciprocate. As we will suggest, this prediction is not consistent with evidence found in the study of conversations. Consider the following example:

Context: A and B had some trouble with humidity in their house. The house had not been heated during the weekend, and clothes are still cold in the cupboard. (translated from French)

A1- It's also wet in here! [in the cupboard]
B1- It isn't wet. It's cold.

In A1, A draws attention to a very undesirable state of affairs: she (wrongly) believes that the clothes are wet. A1 brings conversational information (*cf.* section 2.1.) and is thus relevant. B's reply can be naturally understood as a cooperative act. B would help A to correctly assess the situation. Maybe this is B's subjective feeling. Face to face cooperation is generally understood as a symmetrical process: what A gives to B and what B returns to A are of the same nature. This is not, however, what happens here. Contrary to A1, B1 does not bring any conversational information. The fact that the clothes are cold is neither unusual nor (un)desirable. Its relevance must be understood in relation to A1. If B's statement is true, then the situation described in A1 is no longer undesirable. In other words, the objective effect of B1 is to cancel the information contained in A1.

Conversation is inherently *a*symmetrical. It is not a mere succession of informative statements, as a description based on face to face cooperation leads us to expect. When a relevant topic has been introduced, addressees' replies either

reinforce or diminish the conversational information brought by the speaker (Dessalles 1993). This is what we observed with B1. Conversational structure emerges from an alternation between information and evaluation (Dessalles 1993). To perform such evaluation, interlocutors often try to show that a previous utterance is not consistent with what they know. Logical consistency is indeed a very efficient test of reliability: it is very difficult to lie and remain consistent. A possible conjecture is that logical abilities evolved as part of the listener's ability to evaluate the quality of information.

The observation of addressees' behaviour in conversation departs from what a symmetrical cooperation scenario predicts. We analyse it as a 'cheating detection', performed not by speakers, as expected in cooperation, but by listeners. This inversion of roles is totally mysterious if we see in conversation a cooperative game. The only viable strategy consists for cooperative speakers to detect uncooperative addressees. The inverted situation, in which listeners are 'choosy', is thus inexplicable. It does make sense, however, if we depart from symmetrical cooperation to explain the evolution of language.

3. Language and coalition formation

3.1. A social role for language

In his book *Chimpanzee Politics*, de Waal (1982) shows the importance of coalitions in the social organisation of our sister species. Our species is however unique in one respect: human beings, as our hominid ancestors presumably did (Dunbar 1996), form large coalitions. Dunbar suggests that language may have played a crucial role in such a social organisation. According to Dunbar, linguistic exchange not only enacts social bonding, but also is often *about* social affairs. What brings people together is a special social activity which consists in gossiping about how people behave in the group. By denouncing uncooperative individuals, interlocutors reinforce their own solidarity.

Gossip seems to be a very common use of language, indeed. However, we cannot see there a justification of language existence. First, information about social 'cheaters' is highly valuable. Why would people willingly give such information to their fellows ? We are back to the difficulty highlighted in the preceding section: if gossip is a form of cooperation, how could it emerge through natural selection ? The fact that speech reaches several individuals simultaneously, through which Dunbar highlights the efficiency of language for social bonding, is also an argument against the symmetrical cooperation scenario (Power 1998). Moreover, we do not see how the gossiping function could determine our specific way to communicate. Language can indeed be used to convey *any* information, a long as it is relevant. We are not bound to talk about social

facts, but we are bound to utter relevant messages. The need to exchange social information does not explain relevance. Relevance, however, does explain gossip. Social misbehaviour, when it is highly unusual or may have bad consequences, matches our definition of relevance. Social relationships indeed prove to be an inexhaustible source of relevant information. Yet, not all social facts are relevant. A given misbehaviour may not seem especially unusual or (un)desirable to the participants. In such case, it cannot be the topic of a conversation.

Gossip is at best a secondary function of language, since there is no evidence of any influence it could have had on the design of the language faculty. If there is a primary social function that constitutes a causal factor of language evolution, this function must still be determined.

3.2. Language as an heterogeneous exchange

We have seen that any plausible model of language based on cooperation leads to evolutionary instability. Moreover, while such models rely on cheater detection performed by speakers, observation suggests that such detection is performed by listeners, rather than by speakers. For these two reasons, symmetrical cooperation cannot be the causal factor of the evolution of language. A possible solution to the language evolutionary puzzle is to consider that speakers have something to gain by using language to make relevant points, something different from mere reciprocation. We suggested elsewhere that relevant information is exchanged for social *status* (Dessalles 1998). Such an exchange is asymmetrical, and does not require face to face cooperation.

If relevant information is given to obtain social status, we understand the speakers' willingness to make their contribution as clear and interesting as possible, as Grice observed. From a biological perspective, a communicative behavior which would give access to social status would have a high selective value. Higher social status among primates is indeed correlated with better chances to reproduce. Social status in human societies is a complex notion, which goes from esteem granted by friends to official social rank. Status is not always apparent, displayed in tangible form. It is often an emergent attribute which results from a complex combination of several attitudes adopted by other individuals like respect, esteem, deference, loyalty, allegiance, admiration, honour, homage, worship. For the purpose of this chapter, we will consider a simplified notion of status, retaining only three features: (1) social status is correlated with biological fitness, (2) social status emerges from others' appraisal of some definite quality Q, and (3) social status is correlated with some form of influence or leadership within coalitions.

From characteristics (1) and (2), we understand how communicative ability can become biologically meaningful: if Q is the aptitude to bring relevant information, then relevant individuals will have a selective advantage. The fact that eloquent individuals are highly regarded has often been acknowledged (Locke 1998). As we will see, characteristic (3) is also an essential hypothesis of the model. It is what makes the model 'political'. By definition, coalitions are groups of individuals showing solidarity in action, *i.e.* being able to take collective decisions. Hypothesis (3) presupposes that higher status individuals are more prone to influence other members in collective action.

If we accept the assumptions of the model, we understand why cheating detection is performed by listeners, as observed above, and not by speakers as cooperative scenarios wrongly predict. Because of its political significance, social status should not be attributed on unreliable grounds. If status is granted according to relevance, addressees must check the informational quality of what they hear, in order to avoid rewarding false or poor information. This explains the actual asymmetry of the conversational exchange at a given moment, with one individual bringing information while the others are checking for consistency and quality. The very existence of conversation as an alternation of argumentative moves is now exactly what one should expect. Conversation emerges from the wish of each participant to reach a correct appraisal of the information initially given. It is not an unstructured series of informative acts. What is at stake is whether the initial speaker's point is worth giving her a bit of status. It is not claimed to be a conscious goal pursued by interlocutors. It only appears as a likely reason why, from an evolutionary perspective, our communicative behaviour was selected.

This scenario, which consists in presenting human communication as based on an heterogeneous trade, relevant information in exchange of status, can give us a satisfactory explanation of why language was originally selected, and why it takes the form of recurrent speech moves. Yet, the behavior of addressees who reward good speakers with status is still, from an evolutionary perspective, mysterious. In what follows, we will look for reasons why listeners would willingly give status in exchange of reliable relevant information. Our third hypothesis about status, namely its correlation with some form of influence or leadership, will show its necessity.

3.3. Hominid politics

Chimpanzees may form alliances for conquering leadership in the whole group (Goodall 1971, de Waal 1982). Typically, two or three subordinate male individuals may cooperate to defeat the group leader and take over the power. As

a result, they have privileged access to common resources and to mates. If we follow Dunbar's account of early hominid social organisation, our ancestors' coalitions were larger and more systematic than in other primate societies. Coalitions are associations based on solidarity. As such, they offer some security to their members. But coalitions are more than that. The power of single individuals is limited compared to what a sufficient number of allied fellows can achieve. No leadership can be exerted over a group without the support of some of its members. As a consequence, individual competition for leadership is replaced, when coalitions are established, by a competition between coalitions. In this context, contrary to what prevails in primate groups, physical strength is by far less important than the ability to enter a successful coalition. The analogy with politics as we know it in modern societies is quite close. We suggest that our remarkable communication system could evolve in this context.

To understand the consequences of this new type of organisation on the evolution of behaviour, we should consider which strategy is best for individuals. It is of course to join a coalition which will accept the newcomer and which presents the best chances to be successful in the political competition. On which grounds should one take the decision to join ? In primate societies, the company of strong individuals is much sought after. From the perspective we propose, relevant information may have replaced physical strength as determining factor in the decision to join a coalition and to remain in it. Coalition formation and maintenance would thus rely on the same mechanism. We suggest that others' ability to utter relevant messages is what individuals appraise before deciding to join a coalition or to remain in it. In the next subsection, we propose a simple simulation which shows that such an account is consistent: a behaviour like language can evolve as a reliable strategy in a context of political competition between coalitions.

3.4. A simplified account of language origin

The simulation used to illustrate the coevolution of status and communication was designed to offer a consistent account. It is of course oversimplified. The notions of coalition, information, status and leadership bear only little resemblance with their sociological counterparts. In particular, the fact that status increases the influence on collective decisions is implemented by considering one leader per coalition. The objective here is simply to arrive at a consistent scenario that can then be used as a basis for further refinements.

We consider again a population of several hundreds of individuals which may carry two genes C and R. C-carriers (speakers) make the first step by choosing another individual and by giving it information. This is costly to the speaker. Speakers all

differ in their ability to give information. Some random non-genetic coefficient P, given to them at birth, affects the quantity of information they are able to convey. R-carriers join the coalition of good speakers. To perform this, they record the best information that was given to them in preceding interactions, and decide to follow new speakers whenever they perform a better informative act. At this point, the game is evolutionary neutral: individuals give information and move between coalitions.
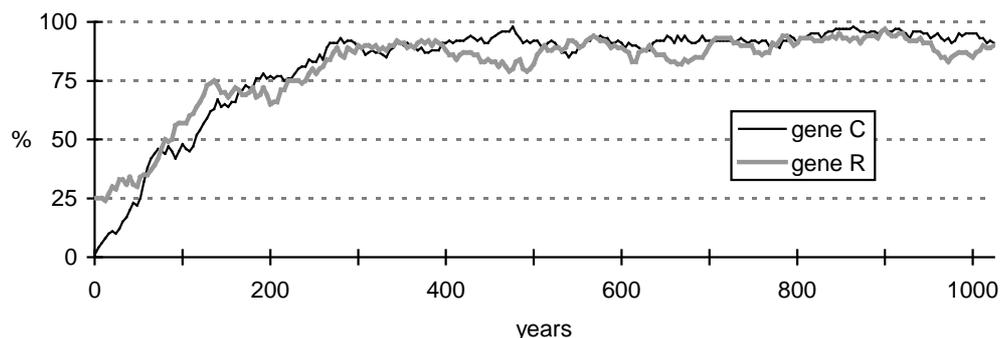

Figure 6: simulation of the 'political' model

Periodically, coalitions confront each other in a competition. Coalitions are ranked according to the intrinsic value, *i.e.* the coefficient P, of their 'leader'. When an individual joins the coalition of a speaker, the latter automatically receives 'status points'. The leader of a coalition is the individual with maximum status. After the competition, individuals are rewarded according to the relative performance of their coalition and to their own status within the coalition. Figure 6 shows how both genes, C and R, are eventually carried by virtually all individuals in the population (if we exclude the residual noise due to mutations). We explain now the respective role of the different concepts introduced in the model.

Communicative competence: individuals differ in their ability to communicate. Individuals who lack gene C remain silent. The communicative performance of individuals carrying C depends on their competence and on a random modulation affecting each communicative act. The competence, stored in coefficient P, is randomly determined at birth, and remains constant throughout life.

Political competition: the performance of a coalition depends on the competence of its leaders. The core of the scenario is that this political competence is supposed to be correlated with the ability to extract relevant information from the environment and to communicate it. This is a strong, but fundamental hypothesis of the model.

Status and coalition membership: status is meant as an emergent property. In our simple realisation, status 'points' are objectively assigned by

followers to successful speakers. Status is thus the results of several interwoven acts of allegiance. Real coalitions are often not materially defined. There is no union card to reify friendship, esteem or alliances. An individual may manifest her/his adherence to a given coalition by showing interest in other members. This is what we mean by following act, and 'followed' members gain status from this. This interpretation of status is consistent with the grooming metaphor introduced by Dunbar, if we consider that listeners implicitly 'groom' relevant speakers.

Information: the intrinsic value of information as such is not so important in this model. We stressed elsewhere (Dessalles 1998) the potential value of relevant information for listeners. Even if this remains a valid hypothesis, it is not necessary for the model. The potential significance of relevant information for listeners' survival may be a mere by-product of the relevance requirement. What is necessary for the emergence of communication in our model is rather the correlation between speakers' ability to produce relevant information and their capacity to influence their coalition in the right direction.

To continue with the political metaphor, we may say that individuals are involved in a continuous elective process. Relevant information is used to advertise one's ability to lead the coalition. Our simulation indicates that language becomes a stable strategy in this context. It is a good strategy for speakers, because they obtain status. The more status, the more chances to be rewarded after the political competition. The strategy of followers, compared to those who lack gene R, is also profitable. The coalition they join is more likely to be successful, because (1) it already contains a competent speaker; (2) this speaker, or a still better one, is likely to get leadership; (3) the success of the coalition is correlated with the competence of its leader.

Could language evolve under such circumstances ? This time, the answer is yes. In the experiment of figure 6, there were actually two alleles C1 and C2 of C. When C1 is present instead of C2 in the genome, the individual utters only a fraction of the information that it would have conveyed with C2. Figure 7 shows that C2 definitely wins over C1. We conclude that there is a selection pressure leading to the expression of the best possible information. Still in the same experiment, there was an allele R' of R in the population. When an individual carries R', it does not respond to speakers. Rather, it joins a random individual, which thus gets status. Figure 8 compares the frequencies of R, R' and non-R-non-R' as they evolve through generations. We see that R wins over the two other alleles. The follower's strategy appears to be evolutionary stable.

This simulation is of course a simplification. In human relationships, leadership is gradual and context-dependent. The model simplifies this relative and
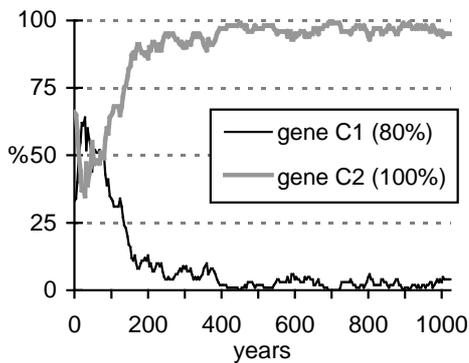
Figure 7: relative proportions of two alleles of gene C. C1-carriers invest 80% of what C2-carriers invest in communication.
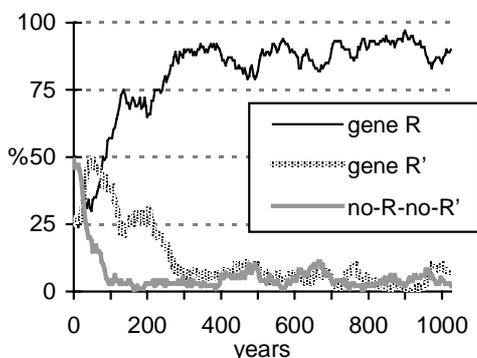

Figure 8: proportions of R and its two alleles. R'-carriers follow a randomly chosen individual. Individuals carrying neither R nor R' show no response to communication.

gradual influence by only considering the leader's role. Status, as it is understood in the model, represents rather a weight affecting the influence of individuals on some collective decisions. The model nevertheless indicates that the coevolution of status and language is a sound scenario.

4. Discussion

The simple model presented in the previous section shows that the evolution of language is at least conceivable in a context of a political competition between coalitions. Language is used by individuals to advertise their competence in producing relevant information. A central assumption is that individuals most competent in this respect are those best able to contribute to coalitionary success in political competition. If we look for qualities likely to give better chances to be politically effective, the ability to spot unusual events or to anticipate desirable or undesirable outcomes seems a good candidate. If

we accept this, then the ability to be relevant is a reliable indicator of potential success and thus a good reason to be followed. This is enough for the communication of relevant information to emerge. We may express the strategies that lead to this emergence through the following maxims: (i) be as relevant as you can; (ii) check the consistency and the exact relevance of information brought by others; (iii) try to establish friendship with genuinely relevant individuals.

Our status-based model of language evolution bears some resemblance to Zahavi's model of prestige. If language, as we claim, is used to advertise some competence, namely 'political' competence, its function is somewhat similar to other signalling behaviours used by animals. For instance babblers, these little birds studied by Amotz Zahavi, seem to compete over apparently altruistic acts like food sharing and sentinel activities (Zahavi & Zahavi 1997). Such behavior cannot result from symmetrical cooperation: "If guarding were based on reciprocity, there would be no point in striving to do *more* guard duty than others." For these authors, the birds behave this way when they can be witnessed by other individuals, in order to get 'prestige'. There is no need to rely on face to face cooperation to explain these apparently altruistic behaviours. Zahavi's theory of prestige provides no evolutionary account of status allocation, though. Our description of language as a signalling behaviour is not only consistent with Zahavi's theory of prestige, but our political model gives an explanation of why status is given to relevant individuals. From Zahavi's perspective, however, there is still a problematic issue about language. For him, signalling behaviours have to be costly, and language is cheap. Costly signals are sometimes claimed to result from the resistance to manipulative signals (see however Noble, this volume), but Zahavi's point is rather that only costly signals are reliable. Babblers indeed don't hesitate to engage in costly activities: they take real risks when serving as sentinel or lose opportunities to feed when sharing food. Being costly, their behaviour is hard to fake. An overcautious sentinel is not a sentinel, and food sharing cannot be simulated. The case of language is thus enigmatic:

> "We don't know how symbolic word language evolved in humans. [...] The rub is that verbal language does not contain any component that ensures reliability. It is easy to lie with words." (Zahavi & Zahavi 1997, pp. 222-223).

Since linguistic acts are so cheap, how can they be reliable indicators of a genuine competence ? We suggested above that logic could have evolved as a powerful way to make lying very hard. If we accept this hypothesis, then relevance appears as much more difficult to achieve. Even if speech itself is not costly, relevance requires continuous efforts and attention. Information gathering and processing needs a lot of investment. This may explain why our species can be said to be 'information oriented': some individuals spend part of their life trying to collect original information on specific subjects and to become recognised specialists.

We dismissed symmetrical cooperation as causal factor of language evolution. This does not preclude, however, the possibility that language generates phenomena that are altruistic or cooperative. Offering valuable information, like offering food, is genuinely altruistic, even if it is biologically motivated by the possibility of getting status. Similarly, language can be seen as a form of emergent cooperation, which differs from face to face cooperation. When competing for relevance and for status, individuals behave for the good of the group. But this kind of emergent cooperation is an effect, not a cause, of our status oriented social organisation.

We concluded from a preceding section that face to face cooperation did not have any causal role in the evolution of language. It does not mean that this form of cooperation cannot exist. Axelrod (1984) showed that external policing, by deterring cheaters, can insure reliable symmetrical cooperation. The problem is that policing itself is altruistic. In our 'political' model, the ability to perform efficient policing could emerge by being rewarded with status, as did the ability to communicate relevant information. The only requirement is that policing be correlated with coalition success. In a context in which policing exists, many forms of symmetrical cooperation become possible, including specific forms of language use. This conclusion is close to Knight's claim (Knight, this volume) about the possibility of cooperative symbolic communication among individuals bound together by costly rituals. The risk of being excluded from the coalition by some form of policing is highly dissuasive, because it means losing the heavy investment made to become a member.

The explanation of the evolutionary origin of language sketched in this chapter is of course far from complete. It addresses the problem of the qualitative difference between speaking and non-speaking species. In our account, conversational competence, *i.e.* the ability to make interesting, relevant points, is a way to advertise one's 'political' competence. Human societies, primitive or not, are complex webs of coalitions. Individual success crucially depends on the ability to form efficient coalitions and to reach some social status. Social status among humans is not extorted by brute force. It emerges from others' willingness to establish social bonds with you. The decision to become closer to somebody is taken according to definite criteria. Linguistic relevance may be an essential component of this choice.

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[i] The notion of relevance is defined here as bringing 'conversational information'. It is a more restrictive definition than Sperber and Wilson's (1986). See (Dessalles 1998) for a comparison.

[ii] What we call *speaker* and *respondent* here correspond to *a priori* independent strategies. A given individual may adopt either strategy, or none, or both of them, depending on its genetic constitution.