



Why talk? An adaptationist approach.

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Section one: the neglect of pragmatic considerations in theories of language evolution, and the illusion of linguistic communism

Many theories of language evolution implicitly assume the idea made explicit by Pinker and Bloom, that language is “tailored...” to “..the transmission of propositional structures” (1990, p.707). Yet much research in (socio-)linguistics, anthropology, sociology, psychology and other disciplines consistently reports that language is used for many purposes other than this. For example, after a period living amongst a tribal community in the Trobriand Islands of New Guinea, Malinowski observed that talk “serves to establish bonds of personal union between two people brought together by the mere need of companionship... it is only in certain very special uses among a civilised community and only in its highest uses that language is employed to frame and express thoughts” (1923, p.316). And Locke (2001) reports Soskin and John’s (1963) recording of two thousand messages produced by a holidaying American couple, of which 75% contained “no transmission of facts or other concrete information” (Locke 2001, p.43).

The generative emphasis on the transfer of propositional information as the defining trait of language has meant that other features – particularly pragmatic ones – have sometimes been neglected in the study of its origins. For example, Hauser and Fitch’s attempt to define the uniquely human aspects of language (2003), in the cause of trying to understand its origins, makes no mention at all of pragmatic considerations. Hauser et al (2002) do

similarly. And Pinker (2003), in discussing language as an adaptation, contends that the language faculty rests on just two principles: words and grammar. For many researchers in the field of language evolution, pragmatics appears not to be a foundational component of language.

Yet it has much to offer. If language were approached anew, and from a Darwinian standpoint, then, arguably, the first questions we would ask would be about linguistic *behaviour*¹; that is, pragmatics. To illustrate: if we wished to study emotion then we might ask, amongst other things, when and why we show emotion. Yet the twin questions of *when* and *why* we use language are little addressed by language evolution researchers, as will be detailed later. In contrast, *how* we use language has, to date, received more attention.

In asking just such questions about conversational behaviour a paradox emerges. Pinker and Bloom (1990) argue that language evolved in response to pressures of communicative efficiency and through a “conventional neo-Darwinian process” (p.707). The adaptive benefits of increased communicative efficiency are clear; pooled knowledge will usually result in better outcomes for all, particularly with regard to the activities that characterised the environment in which *Homo sapiens sapiens* emerged, like hunting and foraging. However, it is equally true that in such an environment there is scope for a selfish individual to listen as much as possible, and thereby acquire information, but not to speak, since doing so may dilute the value of the information they hold. Such an individual would prosper; he or she can make use of knowledge held by others at no cost to themselves.

¹ *behaviour* is used, here, in a narrow sense, to include pragmatics but to exclude other aspects of language.

This problem is perhaps best illustrated in game-theoretic terms. Though this runs the risk of labouring the point somewhat, the issue is fundamental to the argument I wish to develop. Consider, then, the classic Prisoner's Dilemma problem: two prisoners have been arrested and are held in separate cells. Each has one of two possible courses of action available to him: he may cooperate with his partner and maintain their innocence, or he may defect and confess to the authorities. The possible outcomes for each prisoner depend not only on his actions but also on the actions of his partner, who faces the same choice. If both cooperate with each other and maintain silence then they will serve a reduced sentence of, say, two years, due to lack of evidence for the most serious of the crimes. If both confess they will be sentenced to the full term but can expect early release due to cooperating with the police; say, five years. But if one confesses but the other does not then the defector will go free and his partner serve the heaviest sentence: ten years. These choices are illustrated in figure 1. What should each party do?

		player two	
		cooperate	defect
player one	cooperate	2,2	10,0
	defect	0,10	5,5

Figure 1: The standard prisoner's dilemma. The numbers indicate the length of sentence each player can expect, with player one indicated first.

It is a well established result that the evolutionarily stable² course of action for each player is to defect, thus ensuring that both

² Evolutionary stability is defined as being the situation in which no player has a motivation to change their strategy (Maynard Smith 1982). This is of significance

players receive sub-optimal payoffs from the game (Maynard Smith 1982).

Consider now the generalised form, as shown in figure two, where $t > r > p > s$.

		player two	
		cooperate	defect
player one	cooperate	r, r	t, s
	defect	s, t	p, p

Figure 2: The generalised prisoner's dilemma, where $t > r > p > s$. Here t stands for temptation to defect, r for reward for mutual cooperation, p for punishment for mutual defection and s for sucker's payoff.

If we consider cooperation equivalent to sharing information, and defection equivalent to remaining silent when in possession of some knowledge, then we see that the question of whether an individual should share information is homologous to the prisoner's dilemma. As are, consequently, the conclusions. That is, the greatest payoff, r , is achieved when others grant me useful information but I do not dilute the value of any information I hold by sharing it. There is motivation to change to a silent strategy. Put another way, a population that willingly shares information amongst itself is open to invasion by freeriders. Information sharing is not evolutionarily stable.

Yet we do not pursue such a strategy. On the contrary, we are a species that desires to speak. That is (exempting pathologies), we are motivated to speak; motivated to share information. Bates

because once an organism has evolved a stable strategy then there is nothing for natural selection to act on. Unless (or, until) the environment changes, an evolutionarily stable strategy will be the most optimal.

goes as far as to characterise humans as having a “robust and passionate urge of some kind to communicate” (1994, p.139). Although some individuals talk more than others, nobody is obstinately silent. In contrast, efforts to teach language to non-human primates often suffer from the primate’s lack of motivation to use what they have learnt, unless food or some other stimulus is provided. As Locke (2001) puts it, “monkeys and apes rarely seem to ‘donate’ information... [and] there is little evidence... that primates use their voices *in order to inform*” (p.39, italics in original). This contrasts starkly with humans, who will pro-actively seek opportunities to talk, and thus to share information. Our willingness to tell others things we think worthy of comment is such an ingrained part of our psychological make-up, and as such is so taken for granted, that we do not notice it for the curiosity that it is. Even pre-linguistic human infants appear to possess such an urge, as evidenced by their use of intonation to convey illocutionary content (Dore 1974, Halliday 1975, Ninio & Snow 1996). The fact that we willingly and pro-actively converse with each other – and thereby share information – presents a challenge to adaptationist theories of language evolution that assume communicative efficiency is/was the overriding selection pressure. Bourdieu has termed this paradox “the illusion of linguistic communism” (1991, p.43).

Miller has expressed the same problem another way: “The trouble with language is its apparent altruism” (2001, p.346). That is, sharing information is an altruistic act, in the sense that it provides a benefit to another at cost to oneself. However, natural selection acts ruthlessly against pure altruism. Where we do see altruistic behaviour it is usually the result of one of two processes: kin selection (Hamilton 1964), where we act altruistically towards kin because we share with them, at least in part, our genetic interests,

or reciprocal altruism (Trivers 1971), in which the favour of an altruistic act is returned at a later date.

Both explanations have been proposed as the solution to the problem. Each may and probably does play a role in our willingness to share information, but they cannot tell the whole story. Fitch (2004) has proposed that kin selection may offer insights into the early evolution of language. However, kin selection says nothing about our apparent willingness to share information with non-kin. Knight (1998), Ulbaek (1998) and Pinker (2003) promote reciprocal altruism as an explanation. However, Miller observes that this, too, is unable to resolve our paradox because “there is always the temptation to cheat by receiving more than one gives” (2001, p.349). This is true, but there are more compelling reasons to reject the reciprocal altruism explanation; these are detailed in section three. In sections four, five and six, it is argued that the matter at hand is resolved by considering utterances as efforts to gain and maintain attention which, in turn, confers benefit on the speaker. This is a refinement of an idea of Dessalles’ (1998), in which, in return for providing information, the listener credits the speaker with enhanced status. The reasons for this change of emphasis are given in section four. Either way, a mechanism is provided by which willing and voluntary information transfer – a hallmark of language use – could begin.

This latter point masks an important subtlety. When we see a system up-and-running we cannot assume that the forces that keep it in place are the same forces by which it started. Consider, as an analogy, a helicopter. The rotor at the back of the helicopter is critical in maintaining balance and as such is an integral part of the system that keeps the helicopter flying. However, it plays no role in take off; the helicopter rises from the ground as a result of the

uplift created by the rotor on its top. Similarly, though one might argue that the principal purpose of language is communicative efficiency, we are still faced with the problem of how the willing transfer of information got off the ground, so to speak. It is here that our willingness to converse with others is puzzling. The theory presented here does not exclude the presence of other selection pressures in the evolution of the language faculty, nor the use of language for other purposes, for example the maintenance of social relationships (cf Dunbar 1993, 1997). It merely offers motivation for speakers to engage in conversation.

Indeed, one might object that there is in fact no problem to resolve because we do not, in fact, convey much useful or usable information in conversation. Instead, it could be suggested that the maintenance of social relationships, say, is a better explicator of our willingness to converse. However, such criticisms are misplaced. For one thing, if the information transferred in conversation was not of value, then there would be nothing adaptive about the ability to transmit complex propositional content. Moreover, the *cognitive niche*, a term used to describe the environment in which modern humans evolved, is defined by its dependency on information. That is, many anthropologists, and others, consider the ecological features that determined the evolution of our species to have been more cognitive than physical; in other words, survival has been heavily determined by one's ability to use cognitive skills in order to prosper in a complex social environment. And a crucial feature of those skills is the attainment and use of information. As Boyer puts it, "humans are constantly immersed in a milieu that is *indispensable* to their operation and survival, and that milieu is information-about-the-environment" (2001, p.138, italics added). Importantly, that environment includes conspecifics, and thus it is no surprise that gossip features heavily in our day-to-day

conversations (Dunbar 1997) and that we are most interested in gossip that we can exploit for social gain (McAndrew et al 2005). In our social relationships and also more generally we are massively dependent on information. It is a matter of almost day-to-day survival (Tomasello 2000). From an evolutionary perspective it should, therefore, be considered a valuable resource, just like food and shelter. Yet much of it is obtained from others.

A computational model of Enquist and Leimar (1993) shows just how integral information – in this case about the behaviour of others – is to the functioning of society. A headline result from a generation of study into the Prisoner's Dilemma is that cooperation is a stable strategy only in repeated games; that is, games in which individuals meet often and are able to remember the results of past interactions. In Enquist and Leimar's model, individuals lived in groups where survival and reproduction was made more likely through the exchange of resources. Once a relationship was established, a process that took a specified amount of time, individuals give gifts to others, where the costs to the donor were half the benefit to the recipient; this ensured that always sharing was a better strategy than never doing so. Agents played one of two strategies. The first was cooperative, in which they engaged in reciprocal exchange in their first meeting with another agent, and continued to do so with them unless the other did not return the favour. The second strategy was freeriding, in which agents accepted gifts but did not repay the favour. As expected, a freerider's ability to prosper was directly related to the size and dispersion of the group. In other words, with more individuals, dispersed more widely, freeriders are less likely to reencounter those they have previously deceived and the necessary condition for reciprocation – that interactions between individuals are repeated – evaporates, and freeriding becomes a stable strategy. Once the

large number of naive individuals is sufficiently large then freeriding becomes an adaptive strategy. In other words, reciprocal altruism is evolutionarily stable only in small and relatively less dispersed groups.

Modern humans are thought to have evolved in groups of around 150 (Aiello & Dunbar 1993). The question, then, becomes whether or not this is a sufficiently large number for freeriders to be able to consistently find new individuals to exploit. Clearly there are many contributing factors: the time required to form new trust relationships; life span; whether or not, and how often, the trustworthiness of an individual can be communicated amongst others; and many more. Given that reciprocal altruism is an integral feature of human relationships, we might conclude that a figure of 150 was sufficiently small to keep such behaviour stable. However, the results of a change to Enquist and Leimar's model highlight the necessity of information in maintaining that stability. In the adapted version of the model, individuals exchange information about the past behaviour of others. Here, freeriding became a maladaptive strategy far quicker, since other members of the group would hear of the deceptive behaviour and thus not engage in relationships with such individuals. As little as 25% of information about others' behaviour needed to be exchanged before freeriding became maladaptive. Thus, Enquist and Leimar's model demonstrates not just the necessity but also the power of information sharing; without it, the exchange of goods and the reciprocal altruism that is such a feature of all human societies is potentially unstable, and open to fatal exploitation.³ Explanation of the superficially altruistic act of information sharing should thus be

³ The details of Enquist and Leimar's results, and their implications for free-riding strategies, are discussed more fully in (Dunbar 1999).

a significant concern for language evolution researchers, and others interested in the social function of language use.

The dissertation is organised as follows: section two reviews two models of social sharing. The first, by Kameda et al (2003), is not designed as a model of information sharing but appears, at first blush, to be adaptable to the case of language. I review the model, and conclude that not only is it unsuited for this task, but that it is in fact flawed even within its original domain. The second model, of Čače and Bryson (2004), purports to explain how information that is of value can be freely reported to others and simultaneously enhance the reporter's fitness. I argue that these conclusions are the consequence of in-built bias and that the model is, in fact, a model of kin selection.

Section three argues that any solution to our problem must consider the benefits conferred on the speaker at least as much, if not more, as those gained by the listener. In other words, the speaker must receive some other payoff from the interaction. This is not an argument that information sharing must be a case of reciprocal altruism; on the contrary, the section argues that the conditions for reciprocal altruism are not satisfied by language. Instead, some other currency must be supplied to the speaker. Section four makes an explicit prediction of what that currency might be: status. Building on the work of Dessalles (1998), and also of Locke (2001), I argue that listeners will confer status on individuals who produce relevant utterances, because by doing so they demonstrate their ability to hold the attention of others. I also present arguments as to why listeners would be motivated to credit

speakers with enhanced status. Sections five and six review the empirical data that supports this theory: section five focuses on the relationship between attention and status, and section six on the evidence that a quest for increased status is suitably adaptive. Conclusions are drawn in section seven.

Section two: two flawed explanations of social sharing

Kameda et al (2003) construct a game-theoretic analysis of the logic of sharing social goods. Here I explore the claims of this model, in the hope that it might be adjusted to fit the case of information. That is, can a similar model offer an explanation as to why and/or when we share information? Put another way, can Kameda et al's model help explain the conditions under which information sharing would be evolutionarily stable?

In the model, a member of a group – the acquirer – has come to possess some resource (typically, say, the meat from a successful hunt) which they may or may not turn into a social good by sharing it with other members of the group – the non-acquirers. Kameda et al define four strategies, of which all individuals adopt one:

Communal sharer (CS) – provisioning the resource as communal property when acquirer and demanding communal provision of the resource when non-acquirer

Egoist (EG) – claiming private ownership of resource when acquirer and demanding communal provision of the resource when non-acquirer

Saint (ST) - provisioning the resource as communal property when acquirer and granting private ownership when non-acquirer

Bourgeois (BG) – claiming private ownership of resource when acquirer and granting private ownership when non-acquirer

The situation is summarised in figure 1.

		<i>as non-acquirer</i>	
		demanding communal sharing	granting another's ownership
<i>as acquirer</i>	provisioning as common property	<i>Communal sharer</i>	<i>Saint</i>
	claiming private ownership	<i>Egoist</i>	<i>Bourgeois</i>

Figure 1 (Kameda et al 2003, p.7): Four behavioural strategies in an evolutionary model of the emergence of a communal sharing norm

When an individual acquires a resource they act according to their choice of strategy. If an individual claims private ownership (ie follows an *egoist* or *bourgeois* strategy) then each of the individuals whose strategy demands communal sharing (ie *communal sharers* and *egoists*) will challenge the acquirer. Therefore, in order to retain private ownership, the acquirer must defeat each of these individuals in a series of one-to-one fights. Each individual is assumed to have equal fighting abilities and the loser to each fight incurs a fitness cost.

Under these circumstances, Kameda et al find that communal sharing is an evolutionarily stable strategy (ESS) if

$$C > (((0.5^{(G-1)}) * (G-1)) / ((1-0.5^{(G-1)}) * (G-2))) * V \quad (*)$$

where G is the group size, V the value of the resource and C the cost of losing a fight. The condition is a loose one: if $G=10$ then communal sharing is an ESS if $C > 0.0022V$; that is, the value of the resource can be but a small fraction of the cost of fighting and yet the strategy of information sharing will remain evolutionarily stable. This constraint will become even more marginal as G increases.

Kameda et al attain this condition by considering the relative payoffs for each individual in the situation in which a given strategy is played by all members of a population and a mutant playing a different strategy attempts to invade.⁴ To attain the condition, three scenarios are considered: the invasion of a population of communal sharers by a single agent playing one of the remaining three strategies. Saints are unable to invade at all and a bourgeois strategy will not be successful if G (the group size) is greater than two; instead, (*) arises from the situation in which a single egoist intrudes on a population of communal sharers.

Kameda et al then explore the conditions under which a communal sharing strategy can invade another population, and conclude that communal sharing “can intrude and proliferate in a group of saints unconditionally, and a group of egoists in the identical (broad) parameter range [as described by (*)]” (p.8). The condition for intrusion into a population playing a bourgeois strategy is:

$$C \leq (G / (2G-4)) * V \quad (**)$$

This is a far tighter constraint than (*). As an example, consider the case $G=10$. Then (**) becomes $C \leq 0.625V$. Kameda et al

⁴ Indeed, the definition of an ESS is a strategy that, if played by all members of a population, cannot be invaded by a mutant strategy

recognise the limiting nature of this condition.⁵ In response, they argue that since saints can intrude a population of bourgeois unconditionally, and since communal sharers can proliferate in a population of saints, then communal sharers can intrude into a group of bourgeois in an “indirect, two-step manner” (p.8). However, two issues should be raised with this hypothesis. The first is that it is just that: a *specific* hypothesis about how a communal sharing strategy might come to dominate in a population. A transition from bourgeois to communal sharing could, in this model, *only* occur if a transition from bourgeois to saintliness occurred first. In other words, Kameda et al’s argument constitutes a statement that communal sharing arises by the invasion of a saintly strategy – sharing whatever goods one acquires but allowing others to claim private ownership – into a population of bourgeois individuals and that a strategy of communal sharing subsequently invaded the now dominant saintly strategy. There seems no reason to believe that such a process occurred in the evolution of *Homo sapiens sapiens*. It is unparsimonious to suppose that, at some point in their evolution, *Homo sapiens sapiens* employed saintly strategies with regard the sharing of social goods.

The second objection renders this scenario even more unlikely. Kameda et al state that “a group of bourgeois’s [sic] is vulnerable to the intrusion by saints unconditionally”. Whilst strictly true, this is only half of the story. In a population of saints and bourgeois the average payoffs for each strategy are identical. This is because what the saintly strategy loses with one hand (by sharing acquired resources) it gains on the other (through access to a share of the

⁵ However, the constraint is in fact even more marginal than Kameda et al acknowledge: in order to derive conditions for communal sharing to invade *and* remain stable we should *combine* (*) and (***) together. This is because (*) address stability and (***) addresses invasion. In the case $G=10$ this gives us $0.0022V < C < 0.625V$

resources acquired by others). Bourgeois returns are constant. Therefore, a saint has no advantage over a bourgeois; it is simply neither at a disadvantage. So whilst a saintly strategy *can* invade a population of bourgeois, what we have is a random walk⁶ in which a change from a bourgeois to a saintly strategy is as likely as the reverse, and in which we begin with a population of bourgeois. It is not difficult to see that a full saintly invasion is highly unlikely in such circumstances, and becomes exponentially more unlikely as *G* increases.

Thus, Kameda et al's specific hypothesis about how a communal sharing strategy might come to dominate is, literally, unlikely. Certainly, their conclusion that communal sharing is "the only strategy... that satisfies evolutionary stability and evolvability simultaneously for a broad parameter range" (p.8) is unjustified. In addition, the model makes (at least) two problematic assumptions. Firstly, no account is taken of the minimal level of resource necessary to survive, nor maximal levels that an individual is able to make use of; it is assumed that sharing individuals will share the whole resource equally, regardless of their own need, and that individuals that advocate private ownership will do so even in times of plenty. Given that the sharing of food stuffs, and specifically meat, is an implicit focus of the work then the absence of such considerations is problematic. Indeed, two of the factors that allow the sharing strategies to dominate the model stem from these assumptions: first, the willingness of sharers to share regardless of their own need; and second, the determination of the bourgeois and the saints to refuse to accept shared goods even when in need. The relative scarcity of resources is a variable that needs to be accounted for.

⁶ A *random walk* is a formalization of the intuitive idea of taking successive steps, each in a random direction.

The second problematic assumption is the process by which it is decided whether or not a resource is shared or privatised. Recall that each advocate of communal sharing will, individually and in turn, challenge any acquirer that claims private ownership. This arrangement is a major contributor to the evolutionary stability of communal sharing in the model: even in a group with one advocate of sharing, the chances of retaining private ownership are only 50/50, and they decrease exponentially as the number of advocates increases. This is highlighted when we consider the general situation in which the number of communal sharers is given by a parameter p . Then we find, again, that communal sharers will receive greater payoffs than egoists (whose strategy is the most selfish) if (*) holds; that is, the condition under which communal sharing offers greater payoffs than egoism is wholly independent of the relative proportions of the two strategies. Put another way, the number of advocates of privatisation – even when they represent an overwhelming proportion of the population – plays no role *whatsoever* in determining whether an individual may retain sole ownership of an acquired resource. This runs contrary to human experience, intuition and, indeed, much recent research: Fehr and Fischbacher (2003), for example, demonstrate how the relative proportions of altruists and egoists in a population can and does affect whether and how much altruists and egoists are able to influence each other. Kameda et al state that “individuals who are loyal to the communal-sharing ideology when in the non-acquirer role can enjoy an advantage in numbers with respect to fighting cost” (p.8). This is indeed true, but it is true precisely because any advantage in numbers that privatisation advocates might enjoy is not factored into the model. Kameda et al’s conclusion, that the “discrepancy in number between the haves and the have-nots... provides an advantage for communal sharers to perform better than

individuals with other strategies" (ibid) is not, as they claim, the result of any intrinsic benefit to communal sharing. Rather, it is an artefact of the model's set-up.

As is clear, there are question marks regarding how much stock can be placed in any conclusions derived from Kameda et al's model. Nevertheless, it might be instructive to consider how such a model might be adapted to the case of information. That is, how does information differ from other goods that one might share? The most immediate feature is its infinitely divisible nature: when I share information, I still retain ownership of it myself. When shared, the value of information is not divided by the number of sharers but is instead fully realised by each sharer. In Kameda et al's model this makes no difference. That is, we find that, again, communal sharers receive greater payoffs than egoists if (*) holds. And as before, this is regardless of the relative proportions of the two strategies within the population. This is because any benefit to be gained from the information is distributed equally amongst those that advocate sharing: communal sharers and egoists. (As before, a bourgeois strategy cannot invade a communal sharing strategy if $G > 2$.)

Although infinite divisibility is one feature of language that any analysis of the logic of information sharing must account for, the matter is in fact more complex than this suggests. This is because information is retained when shared, but its fruits may not be. An individual may inform a group of conspecifics that wounded prey lies nearby and still be in possession of that knowledge himself. However only one (or a few, working together) of the group can actually benefit from slaying the prey and claiming ownership of the meat. Yet this only applies to some forms of information. Other data – like social gossip – does not require further action in order to

reap the benefits; in these instances the knowledge itself *is* the benefit. So (at least) two types of information exist: one whose payoffs come immediately from possession, and another that requires some form of application before the payoffs can be realised. Though the value of both may be diluted by sharing, this is more likely and more consequential (in terms of relative payoffs) in the latter case.⁷

A second and arguably more fundamental aspect of language that any model must explicate is that information is relatively easy to hide. Acquired material resources (like, say, meat) are hard to hide from the community; Kameda et al, citing Cashdan (1989), argue that "a common feature of hunter-gatherer societies is a lack of 'privacy'; it is highly difficult to conceal acquisitions of food from other people's eyes" (p.4). Information, having no physical presence, is, in contrast, more easily hidden. One could of course argue that we have evolved mechanisms for detecting dishonesty, including the ability to recognise liars (Yamagishi et al 2003). However, consistent with a Red Queen style arms race (van Valen 1973, Ridley 1993), defence mechanisms that make us better liars might be expected to evolve. Therefore the ease with which information is hidden from conspecifics is best accounted for by the use of a variable that defines the ease with which information, and signs that information has been acquired, is disguised.

Finally, honesty should be accounted for. Human utterances are generally honest; we are reluctant to lie. Truth-telling is a central

⁷ I suspect, however, that this difference is inconsequential in the case of language; that is, it seems (though research would be needed to support this) that, when sharing information, the relative payoffs for each party are not a factor that is considered. Rather, we share information for other reasons. What those other reasons might be, and what they mean for an evolutionary interpretation of information sharing, is the focus of section four. Instances where this is not the case are those which, I tentatively suggest, require a conscious, Machiavellian overriding of our natural instincts.

tenet of our pragmatic behaviour (Grice 1975). In contrast, lying requires a conscious effort that overrides our natural inclination to be honest; this is the basis of lie-detector machines. Therefore, any model should be one of *honest* signalling, one in which agents reap greater benefits from truth-telling than they do from mendacious manipulation.

What behaviour would we expect if we account for all of the above? Brief consideration illustrates why such a question is premature: at present, we are yet to define why individuals should share information *at all*, let alone honestly. Until we do so, we do not have a framework within which to consider issues of infinite divisibility and the like. As we saw in section one, information is a potentially valuable resource and sharing it is, under an initial analysis, an altruistic act. Therefore, in order to build a model of information sharing we must first contextualise it within some explanation of altruism, or, alternatively, explain what payoffs might be available to those that share information.

Čače and Bryson (2004) have attempted to provide such an explanation. They produce a model in which individuals altruistically share information and yet still prosper. Agents share information with those in their immediate vicinity, and a propensity to share information is genetically determined. The information transmitted is about the edibility of some food stuffs. In the competition for survival, sharing such knowledge dilutes its value – those with whom you compete are at a greater risk if you do not share the information – and that renders such behaviour altruistic: it is a cost paid by oneself for the benefit of others. We might therefore expect that those that do not share information would prosper. Yet Čače and Bryson's result contradicts this expectation. Miller points out that any theorist who can explain the evolutionary

origins of a trait without invoking natural selection or kin selection could “look forward to a Nobel prize” (2000, p.334); equally, if Čače and Bryson could explain *how* the altruistic act of information sharing prospers without recourse to reciprocal altruism or kin selection then they could anticipate a similar fate: these are the only known Darwinian explanations of true altruism, period, and discovery of a third would constitute a huge scientific breakthrough. However, although Čače and Bryson explicitly reject kin selection as an explanation (p.5), that is in fact exactly what they have modelled. Offspring tend to remain close to their parents, and thus those that we share information with are also those with whom we share a genetic interest. Thus, those that prosper are those in large kin networks and, over time, the population will consist of clusters of related individuals, with very little movement between such groups. Only if the variables of spatial distribution and relatedness can be separated can we exclude kin selection as an explanation, a fact recognised by some other modellers (eg Oliphant 1996). What Čače and Bryson’s model really shows is that, assuming such an instinct may be transmitted genetically, then sharing information with kin is better than not doing so. This is unsurprising but it does not, despite Čače and Bryson’s claims, explain why we do the same with non-kin.

The models of neither Kameda et al nor Čače and Bryson are suitable for the purposes of explaining the altruistic sharing of information: Kameda et al make unrealistic assumptions and draw unverified conclusions, while Čače and Bryson’s model is one of kin selection. Whilst useful insofar as it goes, their model does not explain why we share information with non-kin. What, then, of other models of reciprocal altruism? More generally, can reciprocal altruism explain information sharing *at all*? That is, is information sharing actually altruistic? The next section argues that it is not,

and therefore that we should be looking elsewhere for explanations of our willingness to share information.

Section three: why information is not the only – nor even the most valuable – currency of conversation

In the first section I outlined a paradox that lies at the centre of adaptationist theories of language evolution: that we *willingly* and *pro-actively* converse – that is, we transfer information – yet doing so potentially reduces our evolutionary fitness. There is individual and cultural variation, to be sure, but there are no individuals (barring pathological exceptions) whose preferred state of being is entirely mute and no cultures in which wholesale silence is the social norm.

Yet this problem has received little attention from language evolution researchers. This is surprising since it presents a problem – a problem so serious that one scholar has termed it “crippling” (Miller 2001, p.348) – to many theories of language evolution that assume a willingness to communicate. Only the following researchers have explicitly acknowledged and addressed the problem in their published output: Burling (1986), Čače and Bryson (2004), Dessalles (1998), Fitch (2004), Knight (1998), Miller (2001), Pinker (2003) and Ulbaek (1998). Čače and Bryson were discussed in section two. The other work is reviewed here.⁸

Miller (2001) and Burling (1986) have suggested that sexual selection – the idea that competition for mates can drive the evolution of certain traits – may have played a role in language

⁸ This review builds upon work first done as assessment for the course *Origins and evolution of language*.

evolution, and hence that our propensity to talk is the result of a desire to advertise oneself sexually. Yet this suffers from two fundamental problems (Fitch 2004). Firstly, sexually-selected traits are usually sexually dimorphic, with the displaying sex (males, in most mammals, including humans) advertising the traits to a greater degree than the choosing sex (females). Certainly men and women use language differently, but taken to its logical conclusion this would predict that women would not talk at all. Indeed, as Fitch notes, females demonstrate greater linguistic capabilities and develop them sooner, and speech abnormalities are more common in men than women. Secondly, sexual display characteristics usually develop after puberty, yet language begins its development far earlier. It is thus difficult to argue that sexual selection provides the only adaptive benefit necessary for language, and thus that it might explain our willingness to share information. A pluralist solution, containing a non-exclusive role for sexual selection, may of course be possible.

In response, Fitch (2004) mounts a convincing case that kin selection (Hamilton 1964) may explain how the sharing of cheap, honest signals might have arisen. Although Fitch neglects to report it, there is also some empirical support for his position: Palmer (1991) conducted a study of information sharing within communities of Maine fishermen, and this has been interpreted in terms of language evolution and the freerider problem by Dunbar (1999). Palmer monitored 1,250 face-to-face conversations and radio exchanges between the lobstermen of two communities. One was a small community descended from families that first settled in the 1870s and could thus be assumed to share a relatively high degree of genetic relatedness; the other was part of a large and busy tourist harbour where, consequently, no similar assumption could be made. Palmer found that information regarding the

presence and/or concentration of lobster formed a far higher percentage of conversational exchange between fishermen in the smaller community than in the larger one. Furthermore, kin were clearly favoured over non-kin when giving information on the precise whereabouts of lobster in both communities, when figures were adjusted for the expected number of relatives in the community (Dunbar 1999). Of course, in a small community, particularly an inward-looking one, there may be little else to talk about, whereas the larger community has a number of other possible topics of conversation, not least the tourists. Nevertheless, Palmer's results provide limited support for Fitch's thesis.

Indeed, Fitch remarks that "it is hard to see how selection favours speech, the prototypical cheap, honest signal, among non-kin during the *early* evolution of language" (2004, p.295, italics added). Yet it is clear that, as modern humans, we do share information with unrelated conspecifics, and willingly so. Kin selection may offer further motivation to share information among relatives and perhaps, speculatively, even provide the bootstrap for linguistic content to be added to primordial utterances. However, it does not enable us to choose between competing theories of why we share information with non-kin.

Knight (1998), Ulbaek (1998) and, in passing, Pinker (2003) all assume that information sharing is an instance of reciprocated altruism. According to Pinker, "if we inform only those people who are likely to return the favour, both of us can gain the benefits of trade" (p.28) and Ulbaek states that "only under the extraordinary conditions of reciprocal altruism can information-sharing take place" (p.41). Yet such "extraordinary conditions" do not apply to language: information sharing is not an instance of reciprocal altruism. There is a body of evidence, that I will now present,

which suggests that not only does the speaker gain from conversation but also that the typical gain is greater for the speaker than it is for the listener. In their efforts to understand criminal motives lawyers place great stock by the question "*Cui bono?*" – who benefits? – and Dennett (1995) has emphasised the necessity to ask the same question when attempting to understand adaptive behaviour. By doing so we quickly see that it is the *speaker*, and not the listener, that is the *principal* beneficiary of conversation. The listener still gains, to be sure – the information transferred in conversation is of value – but the payoffs offered to the speaker are, generally, greater than the payoffs offered to the listener. What that benefit to the speaker might be is discussed in section four. In this section, however, I wish to defer that particular matter, and instead focus on the evidence for the above assertion: that the speaker benefits from conversation, and more so than the listener. What is that evidence?

It is a central tenet of evolutionary psychology that our brains are evolved organs that are susceptible, as all organs are, to the pressures of natural selection (eg Barkow et al 1992). Consequently, our innate psychological tendencies leave us well-equipped to deal with the challenges of complex social interaction as they were encountered in the environment in which we evolved. As Cronin puts it: "We are walking archives of ancestral wisdom" (1991, p.3). One example of just such wisdom is the existence of strategies for detecting social cheats. Cosmides (1989) has shown that we find problems contextualised in terms of a social contract far easier to solve than those expressed in any other terms. For example, when asked which facts are relevant to the preservation of the rule "If you take a pension then you must have worked here ten years" subjects will, if asked to put themselves in the position of the employer, pick out the correct answers. However, when asked to

consider the matter as though an employee, sentences like “worked here twelve years” and “did not get a pension” are deemed relevant (Gigerenzer & Hug 1992). Yet these sentences are not relevant to the question being asked. As Cosmides concludes, we have a mind that “includes cognitive processes specialized for reasoning about social exchange” (1989, p.187, but see, eg, Gray 2003 for a different view). Thus, we should be able to draw conclusions about the nature of behaviour from the presence of such mechanisms. That is, by reverse engineering from the situations in which we suspect and detect deception, we can deduce the form of our social contract. Put another way: one of the headline results that emerges from a generation of study in evolutionary game theory is that cooperation is stable in repeated games only when players are able to impose punishment on those that defect (eg Alexrod 1984). Thus, we should therefore expect that behaviour we consider disagreeable to be directed at the agent who, during conversation, flouts the accepted rules of information exchange.⁹

From this perspective, two observations are telling. The first is that one particular conversational behaviour is frowned upon: lying.¹⁰ Given that the information transferred in conversation is of social value – McAndrew et al (2005) asked subjects to rank the interest value of different gossip scenarios, and their results show a clear correlation between interest in gossip and the exploitability of that gossip for social gain – and that tactical deception has been observed in primates (Byrne 1996, de Waal 1982, 1992), then “the grounds for conflict of interest and for ‘Machiavellian’ manipulation

⁹ There are general objections to the approach of Evolutionary Psychology (as distinct from evolutionary psychology) (eg Rose & Rose 2001, Sterelny & Fitness 2003). However, the studies cited do not, in and of themselves, require a necessary adherence to the tenets of Evolutionary Psychology, and all that that implies.

¹⁰ Other such behaviours might include hogging the floor and the like; I deal with these in the paragraph on pragmatics, below.

of gossip among super-intelligent hominids are evident" (Power 1998, p.116). Thus, sensitivity to such behaviour has obvious adaptive advantages and explains why conversational cheats are those that lie; those that offer information that, by virtue of being untrue, is of little value to the listener. In support of this logic, the existence of psychological mechanisms that can detect such behaviour has received recent empirical support: Yamagishi et al (2003) found that the commonly-held belief that untrustworthy individuals can be identified simply because they *look* untrustworthy to be borne out in the laboratory.

In contrast, the second observation is that those who are silent are not perceived as committing a conversational offence. In other words, such behaviour is not, typically, Machiavellian. Note that the assumption that language is used for information transfer would predict the opposite, since remaining silent would result in greater payoffs than speaking, and thus we would expect to find a psychological mechanism geared to detecting and ostracising individuals that demonstrate such behaviour. Yet we see no such thing. It might be suggested that, although not of the same ilk as lying, silence is still a conversational offence. In response, I would submit that silence is not offensive, as such, but simply strange. If it is a conversational offence, it is only in so much as it suggests unusual rather than incorrect behaviour. Indeed, if, as is argued, the speaker gains from conversation, then this is unsurprising, since habitual silence passes up the opportunity to receive whatever gain is on offer to speakers. Thus, the psychology of conversational behaviour suggests significant adaptation for the speaker.

It is worthwhile to consider boredom in the same light. We become bored with conversation when speakers offer information in which we have no interest (at the moment of utterance). That is, as the

listener we deem the utterances of little or no value to us; they are not worth our attention. Thus, as Dessalles (1998) emphasises, we have an explanation for the origin of relevance. Relevant utterances are, by this definition, those that carry some value for the listener: they contain *new* and *interesting* information. Irrelevant utterances, then, are those that carry no such value. Indeed, McAndrew et al's (2005) results are again instructive here. Subjects were given a number of gossip scenarios and data was collected on the interest value of those scenarios, on the likelihood of spreading gossip, and on whom they were most likely to tell. McAndrew et al found that we are most interested in gossip that we can exploit for social gain. Information that was not interesting, and therefore irrelevant, was that which was not of use to the listener.

In such situations, it is a waste of the listeners' time to remain attentive, and thus we also have an evolutionary explanation of boredom, as a mechanism that prevents us from wasting time. In the case of conversation, it acts – as physical pain does – to prevent us from pursuing an activity that is maladaptive, since the time spent listening to a boring individual might be better employed in some other way. Consider also the possible courses of action that might follow a listener becoming bored (Hurford, personal communication): either the speaker continues to talk to an individual that is not listening, or they stop. In both cases, the speaker receives no benefit from the interaction. Therefore, in order to gain from conversation, the speaker must produce relevant utterances.

Furthermore, both our biology and our pragmatic behaviour show greater adaptation to the speaker's interests than to the listener's. Our ears are little evolved from primates whereas our vocal tracts

have evolved significantly since the last common ancestor (Lieberman 1984), and are more developed than is necessary in order to produce unambiguous utterances. Brief calculation shows that the potential number of, say, four-syllables words that a human can produce, even under dialectical limitations, is far greater than the number of words in the average lexicon: assuming a language of just eight (sufficiently distinct) consonant sounds, four vowel sounds and consistent CV syllable structure, then there are $8 \times 4 = 32$ possible two-phoneme words, $32^2 = 1,024$ possible four-phoneme words, $32^3 = 32,768$ possible six-phoneme words and $32^4 = 1,048,576$ possible eight-phoneme words. Yet languages with many more than eight consonants and four vowels still have words with many more than eight phonemes. Furthermore, a language with 20 vowels or diphthongs and 24 consonants (as the southern English dialect has) and consistent CV syllable structure has $20 \times 24 = 480$ syllables and $480^2 = 230,400$ four-phoneme combinations, yet estimates of the size of a speaker's lexicon are typically in the 50,000 to 75,000 range (eg Oldfield 1966, Pulvermüller 1999), and many words are longer than four phonemes anyway. The full range of linguistic content could still be produced with a vastly simplified vocal tract.¹¹ Tomasello and Bates summarise the situation thus: "human languages are adapted to general mammalian perceptual capabilities... [whereas] human speech has clearly evolved with the *production* of language as its primary adaptive context" (2001, p.3, italics added).

With regard to pragmatics, the rules that regulate our conversational behaviour are placed upon the speaker rather than the hearer. Turn-taking rules, for example, regulate who speaks, but not who listens, and those who yield the floor are considered

¹¹ Again, this argument is extracted from the essay I submitted for assessment as part of the course *Origins and evolution of language*.

altruistic rather than selfish (Miller 2001). And Grice's maxims (1975) regulate speech, not attention. These points should be emphasised: we so take for granted the fact that people will willingly offer conversation and information that the converse behaviour is inconceivable. Yet, were it maladaptive, we may argue that natural selection would have acted with its customary efficiency to remove it. The fact that our pragmatic behaviour is as it is highlights the fact that, like our biology, our psychological makeup shows greater adaptation for the purpose of utterance production than it does to utterance interpretation. This is because the *principal* beneficiary of conversation – that is, the agent who receives the greater evolutionary payoff – is the speaker.

One might object to this analysis by pointing out that, yes, *of course* pragmatic rules regulate the speaker and not the hearer, because the situation could not be otherwise. Listening is, after all, a passive act: pragmatic rules could not regulate *how* we listen. However, the objection is misplaced. Most pragmatic rules are rules about the *content* of utterances. Grice's maxims, for example – Quality, Quantity, Manner and Relevance – regulate how the speaker must *construct* an utterance. This could be otherwise: pragmatic rules could regulate how a listener should *interpret* an utterance. However, this is not the case: there is, for example, no maxim instructing the listener to assume relevance. The make-up of our pragmatic behaviour suggests that the speaker is responsible for making communication easy and possible, a point also made by Sperber and Wilson (1986). This is because conversation, it is suggested, is adaptive in the first instance for the speaker rather than the hearer.

The more we look, the more we find evidence that natural selection acted on our ability to communicate rather than interpret. Hurford

(2003) has used computational modelling to show that if an agent's *communicative* success is the basis for selection then synonymy is rare and homonymy is tolerated, just as is observed in virtually all recorded languages. In contrast, if *interpretative* success is used as the basis for selection then the converse situation – unknown in natural language – arises: homonymy is rare and synonymy tolerated. As Hurford puts it, and as we have now seen in a variety of different ways: “humans evolved to be well adapted as senders of messages; accurate reception of messages was less important... *we may be primarily speakers, and secondarily listeners*” (p.450, italics added). This is because the greater payoff in conversational interaction is available to the speaker rather than the hearer.

Seen together, this is an impressive array of evidence that information is not, as it first appears, a simple altruistic act. If that is the case, then reciprocal altruism becomes not just an unnecessary explanation but a false one: information sharing did not evolve because the favour was returned at a later date, but instead because it actually conferred benefits upon the speaker. Any explanation of information sharing as reciprocal altruism, including, for example, any modification of Kameda et al's model discussed in section two, is an inappropriate mechanism.¹² Our motivations to share information and to share social goods are different.

If, then, the speaker gains from conversation, and more so than the listener, what form does the payoff take? Dessalles (1998) has proposed that conversation evolved as an exchange of information

¹² It might be argued that reciprocal altruism does, sometimes, occur in the case of information sharing. Witness teenagers' gossip: “I'll tell you if you tell me”. However, this reciprocation is engineered, and constitutes a minority of our linguistic interaction. Of course, such isolated scenarios might be explicable by some model of reciprocal altruism, but this does not explain the phenomenon of information sharing in more general terms.

and status; that when we communicate information we are, in return, granted greater status. Importantly, this is *not* an instance of reciprocated altruism: it is not the result of a mutual agreement to return favours previously granted. Rather, it is a direct and (more-or-less) immediate exchange of social currency: information on the one hand, status on the other.¹³ In the next section I propose a modification to this idea: that information sharing is one way by which we can maintain the attention of others, and that it is in this way that listeners credit speakers with increased status.

¹³ Note that, although the *exchange* is immediate – the creation of status in a speakers' mind on the one hand and the transfer of information on the other – the attainment of the benefits associated with each is delayed.

Section four: utterances are used to gain and maintain attention – explanation and implications

As we have seen, traditional theories of altruism – kin selection and reciprocal altruism – are unsatisfactory explanations of our willingness to share information. On the one hand, we share information with non-kin. On the other, the evidence suggests that speaker does not just gain from sharing information, but that the speaker gains more than the listener. Therefore, we can conclude that relevant utterances are produced because by doing so a speaker may enhance his or her own fitness. But in what way? That is, what benefit does the speaker receive from sharing information?

Dessalles (1998) proposes that the production of relevant utterances by a speaker causes listeners to credit the speaker with enhanced status. He draws an analogy with academic publications: “The effect of publishing good papers... is that the author is accepted and recognized as a good scientist and gets a higher status in the scientific community” (ibid, p.140). That is, the reason that academics compete to publish papers – but do not *compete* to read them¹⁴ – is precisely because it enhances their status (as good academics), just as the production of relevant utterances enhanced

¹⁴ There is perhaps some form of competition in academics’ attempts to be the most well-read, and to publish papers that cite a wide range of good research. This is, however, a secondary form of competition: the reading list is not the criteria for competition in and of itself; rather, it is one part of the larger goal of achieving academic excellence. To illustrate, consider an academic’s CV, arguably the most salient advertisement of their academic status. Here, individuals list publications – and do so near the top of the CV – but do not detail the contents of their bookshelf.

the status of our hominoid ancestors.¹⁵ So, pro-active utterance production grants the speaker the opportunity to gain status in exchange for the provision of information that is of value to the listener. Note that this behaviour is not altruistic. Rather, it is an exchange between speaker and listener: on the one hand the listener gains knowledge, whereas on the other the speaker gains status. It is a mutually beneficial exchange.

Motivated also by the work of Locke (2001), who draws a three-way parallel between attention, rank and volubility, and who emphasises the role of rank and relationships in the evolution of language, I propose a refinement to this idea. That, by conveying relevant information, we receive *attention*, and it is the maintenance of that attention that earns status, through the continued production of relevance. This is only a subtle change from Dessalles' theory; in one respect, it merely adds the extra layer of attention between the production of speech and the conferring of status. However, it makes more sophisticated predictions that better fit the empirical data. For example, if the production of relevant utterances produced status in return then we would expect talkativity (so long as it were relevant) to correlate with status; whilst perhaps true in a very broad statistical sense, this is a crude prediction. If, instead, the criterion is the maintenance of attention, then eloquence and content, among other things, become the expected correlates of status. This seems intuitively more likely and, as we shall see, it fits better with the evidence.

Furthermore, Dessalles' claim that efforts to acquire status can explain the origin of relevance (1998) comes into sharper focus in this light: what is relevant is what maintains attention. As Dessalles

¹⁵ One might ask, at this point, what evolutionary benefits are offered by status. I will address this question in section six.

highlights, a corollary of his idea is that what is relevant is that which is *new* and *interesting*; in other words, that which is of value to the listener, in the sense that the information is exploitable for social gain. However, utterances deemed relevant by the listener sometimes do not convey propositional content. Thus, the equivalent corollary of the idea under discussion is that relevance is that which maintains attention. This seems more intuitive and, although it sounds initially tautological, it is not: the claim is that maintaining attention comes first, and from this grows the notion of relevance.

A clarification: in one sense it is stating the obvious to say that utterance production produces attention. However, this interpretation misses the point. Simply vocalising to attract attention serves no adaptive purpose in and of itself. Indeed, repeated to no end such behaviour could be assumed to be maladaptive, since conspecifics would learn to ignore it, with obvious unwanted consequences. Fables are not the only warning against crying wolf too often; the dulling effects of doing so are also observed in primate behaviour (Hauser 1986). Rather, it is an individual's ability to *maintain* attention that brings them status or some other payoff.

Crucially, this scenario falls squarely within the influential framework of Krebs and Dawkins' theory of mind-reading and manipulation (1984), which states that all communication can be understood as an attempt to achieve one or the other of those two goals. Krebs and Dawkins argue that where the communicator attempts to manipulate the interpreter for their own ends, the interpreter tries to infer – mind-read – the communicator's intentions and act accordingly. In the instance of information sharing, speakers attempt to manipulate others into conferring

status upon them while listeners mind-read: they evaluate the utterance and act in their own interest. They listen if it is worthwhile to do so; or they do not, if it is not. Hence, the listener determines what is relevant, and the speaker – the manipulator – must abide by the listener's needs, lest they become bored.

Equally as importantly, this process – that the provision of information maintains attention and thereby gains status for the speaker – is not an instance of reciprocated altruism. Altruism is paying a cost oneself for another's benefit, and reciprocated altruism is doing so in the expectation that the recipient will return the favour at a later date. In our scenario, the speaker is not sharing information in the expectation that some equivalent benefit will be offered in return. Rather, information sharing is a strategy that an individual can employ in order to maintain attention and thus gain status. Altruism, whether reciprocated or not, involves paying a cost; in contrast, in our theory the speaker receives a payoff.

Thus a form of exchange occurs, in which the speaker gains status and the listener gains information. Does it pay both speaker and listener to go along with this exchange, or are there circumstances in which one or the other player might defect, accepting their gains but not conferring the expected benefits upon the other? More specifically, why should a listener credit a speaker with enhanced status? Why not simply accept the information on offer but not confer increased prestige upon the speaker? In other words, is such a dynamic evolutionarily stable?

Recall that evolutionary stability – the situation in which no individual has motive to change strategies – is precisely the problem with theories of language evolution that assume that

reciprocated information transfer is the evolutionary purpose of language: an individual that decided not to share information that it holds would prosper if information transfer were the only selective pressure acting on language. In contrast, there are at least two theories that might explain why framing the conversational exchange in terms of attention produces evolutionary stability. The first is Henrich and Gil-White's information goods theory (2001). The second builds on the handicap principle (Zahavi 1975, Zahavi and Zahavi 1997) and specifically Zahavi's extension of his idea to a generalised model of prestige (1995). I deal with these in turn.

Henrich and Gil-White's information goods theory views prestige as "an emergent property of psychological adaptations that evolved to improve the quality of information acquired via cultural transmission" (2001, p.165). More precisely, they argue that the advent of social learning, and in particular the evolution of the ability to imitate, meant that good models of desirable behaviour (for example, successful hunters) were credited with prestige by conspecifics. This is because just such sycophantic behaviour grants an individual greater access to the individual whose behaviour they wish to imitate, and thus to first hand experience of the behaviour itself. Indeed, as Henrich and Gil-White point out, in the environment in which we evolved this might be the only way to access such information; consider, for example, the complex practices involved in hunting and tracking game. We should therefore expect that high-ranking individuals are more often considered close allies, because we might expect some form of privileged access to such individuals. Whilst perhaps a surprising prediction, Grammar (1992) has found just such a correlation in child studies. It would be interesting to perform the same experiment with adults, and cross-culturally.

If the advent of some form of language enabled the transfer of propositional content, then the granting of status to skilled individuals that Henrich and Gil-White's theory predicts would likely have been quickly transferred to the new medium. That is, pressure exists for individuals that are talented in some useful field to advertise themselves as such because by doing so they are credited with status. Thus, seeking attention becomes adaptive if one is able to use it to advertise one's talents. This is evolutionarily stable because neither party has motive to change strategy: the speaker is being credited with status, and the listener is gaining privileged access to the speaker.

It is worth, here, digressing a little to consider Gil-White's (2002) application of this theory to a specific problem of language evolution. He argues that the preferential imitation of individuals with above-average quality of information can help explain the process by which primate displays evolved into human utterances. Indeed, if the maintenance of attention allows an individual to manipulate an interaction for their own gain, then pressure exists to use devices that can maintain one's position as the centre of attention. These devices might include eloquence, unusually impressive displays of socially useful traits like strength or intelligence or, indeed, better quality information. We might thus suggest that some universal features of language could have arisen from the need to capture and maintain attention. In this way, early hominids would be able "not merely to be argumentative, but to argue; not merely to act in a questioning manner, but to ask" (Locke 2001, p.40). Locke's claim, that "those who spoke in unusually fluent, rhythmic, novel and elaborate ways were eligible for higher rank and more efficient relationships" (ibid) fits nicely with Henrich and Gil-White's idea that high-quality individuals were preferentially imitated. I agree with this sketch, and speculate further: that it was the attention

maintaining capability of such utterances that conferred such benefits upon the individuals that spoke them. Several researchers have proposed that it is by a similar process that the rudimentary grammar observed in birdsong evolved (Okanoya 2002, Sasahara & Ikegami 2004). Though Gil-White argues that a system of prestige is a prerequisite for language, the above speculations are independent of that claim.

Returning to the matter of evolutionary stability, we should also consider Zahavi's generalised model of prestige (1995), which Dessalles (1998, 1999) suggests is applicable to the theory under discussion. The handicap principle states that handicaps – evolutionary costs – have evolved in some environments because they signal the individual's ability to incur such costs and prosper *despite* their presence. In the general model, altruistic behaviour may have evolved as a costly signal of quality. Here, prestige is granted to individuals who perform altruistic acts. Note that both parties gain, either as the recipient of an altruistic act or from increased prestige. However, only high-quality individuals can gain such prestige, since only they can afford to incur whatever costs are associated with the altruistic act. Computational models (Dessalles 1999) show that such behaviour can be evolutionarily stable so long as coalitions develop and so long as prestige that is granted by one member of a coalition is recognised by another.

How does this apply to the present discussion? If we can show that information sharing only occurs in a society formed of coalitions, and that prestige granted by one member of such a coalition is recognised by another, then the maintenance of another's attention – achieved by the process of conferring relevant information – and the reciprocal granting of prestige, or status, becomes evolutionarily stable. The first of these conditions – that coalitions are a

necessary prerequisite of information sharing – is easily satisfied. Indeed, it is widely acknowledged, by scholars from several different disciplines, that group living was a prerequisite for language itself (eg Knight 1998, 2002, Tomasello 1999, D'Andrade 2002, Call & Tomasello 2003). What of the other requirement? Will status granted by one individual be recognised by another? The answer is yes, because recognition of status by others commits the status-holder to acts of public good, from which all coalition members benefit.

How does this work? Status, or prestige, is a spatially constrained characteristic; it exists only in the minds of individual members of the community, and thus one cannot take advantage of high status (or, indeed, suffer the consequences of low status) outside the environment in which it is granted. Therefore, in order to remain high-status, an individual must remain a willing member of the coalition. And this incurs costs: high-status individuals will only remain so if they continue to demonstrate their quality, and this is done by maintaining others' attention. This, in turn, requires that some social good be provided, be it information, meat, diplomacy or some other resource to be shared. In other words, acknowledgement of status acts as a bargaining tool; if high status individuals do not cooperate with the group, then that status, and the benefits it accrues, is removed. Crucially, this dynamic ensures that the costs of being held in high regard are greater for low-quality individuals, since they cannot afford the time and/or resources to provide the social good necessary. Thus, information sharing acts as a Zahavian handicap.

Subsequently, the pro-active production of relevant utterances becomes an evolutionarily stable strategy. Note that this is true regardless of rank. Krebs and Dawkins (1984) show how the

honest signalling of quality is adaptive even for low-quality individuals. This is because not signalling will lead others to assume that you are of lower quality than all the individuals who do signal. Such behaviour will cascade down through the population, and signalling of quality becomes adaptive for all but the very lowest-quality individual. The same is true of utterance production. Silence would lead others to assume that you were of low quality, and thus everybody will speak, at least to some degree.

Dessalles himself argues that the evolutionary stability of a model in which status is given in return for information (or, as I have expressed it, the ability to maintain attention) is explicable by the necessity of forming coalitions (2000). That is, he claims that in early hominoid society the ability to enter and remain in successful coalitions would have been paramount to survival: physical strength would have been “far less important” (p.73) in comparison. In this scenario, we produce utterances and share information in efforts to gain status and thereby be seen as a potentially desirable member of a coalition. This idea has some merit – certainly the role of coalitions in early hominoid society should not be neglected in the study of language origins – but equally it seems insufficient: it does not even nearly capture the many different uses to which language is applied. For example, why talk amongst your coalition if your status and value as a coalition member were sufficiently well-established? As we shall see, high status individuals are among the most talkative in any society. A variety of similar objections could be raised. A more general explanation, like those discussed above, is necessary. Consequently, I do not promote this as an explanation of the evolutionary stability of voluntary information sharing.

Instead, I submit that Henrich and Gil-White's information goods theory and Zahavi's generalised model of prestige are more likely explanations. However, I do not wish, at this point, to choose between these two ideas. Indeed, there is no reason to think that the two are mutually exclusive and that we need to choose between them at all. The point that should be emphasised is that by turning an apparently one-way dynamic – the sharing of information – into a two-way transaction – where information is given up in return for attention – we can achieve evolutionary stability. As already discussed, this contrasts with any theory that assumes that the reciprocal transfer of information is the only selection pressure worth regarding.

One possible objection to the idea under discussion is that, on a first reading, it suggests that we should all talk as much as we can, and that there should therefore be no individual and cultural variation in conversational habits (Hurford, personal communication). Yet such variation does exist: some people talk a lot, others very little; some cultures are highly talkative, others are not. How might this be explained?

With regard to individual variation, let me speculate further. According to the idea under discussion, an individual will receive status only if they are able to maintain attention. If, on the other hand, one has nothing of relevance to say then talking confers no such benefit, and thus some variation should be expected. However, it also seems reasonable to assume that there are also consequences of supplying *irrelevant* information. Of course, if the speaker is unaware of the listener's knowledge then such occurrences are typically ignored, or forgotten. But continually bringing attention to oneself yet failing to maintain that attention often results in a form of social rejection, in which the individual is

perceived as uninteresting. This is because, as already discussed, the listener evolves a mechanism – boredom – to prevent attention to irrelevance, and the speaker evolves linguistic behaviour – behaviour that is formalised by the Cooperative Principle – that prevents just such an occurrence. Thus, I argue that, in addition to enhanced status being granted to those that can maintain attention, *reduced* status is the consequence of failure to do the same.

Under such circumstances, what type of society should we expect? I tentatively suggest that such conversational dynamics (and certain assumptions of spatial distribution, since the risk that others will ‘spend’ the information on agents you hoped to inform yourself must be considered) would produce a variety of strategies: some individuals would pursue a strategy of attempting to gain and maintain attention often, even when unsure of relevance, while others would talk less often, and thereby be less exposed to the consequent risks. That is, individual (and perhaps even cultural) variation could be in part explained as an emergent property of a self-organising system, in which individuals can assign status to others and still benefit themselves.

Indeed, it should be noted that variability within a population is not necessarily the product of non-adaptive deviations from an optimum and can in fact result from different strategic approaches to the same problem (Dall et al 2004). Furthermore, several species demonstrate mixed strategies; that is, they exhibit different approaches to problems depending upon variables such as sex and age, and the strategy employed is the most adaptive under the given conditions (Gross 1996). Exploration of whether such phenomena might emerge from the dynamics discussed would be a fruitful application of the computational modelling techniques that

have become such a feature of language evolution research in recent years (eg Cangelosi & Parisi 2002).

And of course, the matter is not so straightforward as a simple tallying of relevant and irrelevant utterances. Indeed, it is precisely because conversational behaviour has a wide variety of causal mechanisms that we should expect variety. There will necessarily be a complex interplay between strategies for obtaining status and traits such as personality, self-analysis of status, context and others. That is, a pursuit of status is not the sole mechanism that explains our talkativity; rather, it is one of many. We might suggest that it has greater causal power than other factors, but nevertheless other variables should be considered.

In fact, there is another dimension that should certainly be considered if we are to properly understand the predictions of the idea. In section two I discussed how information is shared and retained at the same time. However, the addition of relevance into the equation means that this is not the whole story; the value of any information to a listener depends upon whether or not they are already familiar with it. That is, I can 'spend' the information in order to acquire a small piece of status by reporting it (in a relevant context) to a conspecific. However, if they are already aware of the information then I cannot maintain their attention in the way I wish. This mirrors our first-hand experience. Indeed, informing another of something they already know violates the Cooperative Principle (Grice 1975), specifically the maxim of Quantity. This dynamic explains why we often seek to be the first to report new and relevant information; if somebody else reports it first then we lose the opportunity to share the information with that particular audience. So, the costs of sharing information are twofold: the possibility (dependent on the specific nature of the information) that

by sharing the information we dilute its value, and also the risk that the listener will later use the information in front of another audience that we may wish to inform ourselves. Again, computational modelling would seem an appropriate mechanism with which to investigate such phenomena.

Thus, development of these computational projects may, in the future, produce support for the theory under discussion. However, several predictions that arise from the theory can be tested against data already available. The next section reviews that evidence.

Section five: what is the evidence that we vocalise in order to attract and maintain attention?

We have seen how the voluntary production of utterances can be theoretically explained as efforts to maintain the attention of conspecifics who, in return, confer enhanced status upon the speaker. What is the support for that position? We have already seen data consistent with this position, in the form of the reasoning we used to conclude that the speaker does in fact gain from conversation. The maintenance-of-attention idea makes predictions about the psychology of conversation, about pragmatic behaviour, and about homonymy and synonymy, all of which turn out to be true.

For example, if one can gain from one's ability to capture and maintain attention then we would expect speakers to compete for the conversational floor, and that turn-taking rules regulate who gets to speak, not who gets to listen (Miller 2001). Furthermore, if the benefits of attention are of greater value than the information transferred – recall that often little propositional content is exchanged during conversation – then no pressure would exist on listeners to compete for access to speakers. It is only because these facts are so obviously true that we fail to notice them for what it is: a prediction of our theory that would be otherwise unlikely.¹⁶

¹⁶ One might object that sometimes we *do* compete to listen, for example by purchasing tickets to hear a dignitary speak. Two points should be made in response. The first is that although there will be times at which the information on offer is of such value that we compete to listen, these represent a vanishingly small subset of all linguistic interaction and would thus not impact on the evolution of conversation. The second point is that there is perhaps a secondary

More specifically, listeners would evolve to be fussy about who they listen to. Consequently, listeners would insist, so to speak, on the following: (i) that speakers do not say more than is necessary; that is, they do not waste the listener's time, nor hog the floor; (ii) that, if holding attention by providing useful information, then that information is true; (iii) that speakers demand attention only at appropriate moments, that is, when the listener is able to contextualise and understand it better; and (iv) that the utterance is clear and not prone to misinterpretation. These four statements are predictions of the theory. They map directly onto the four Gricean maxims of the Cooperative Principle (respectively: Quantity; Quality; Relevance; and Manner (Grice 1975)) and are thus consistent with the idea under discussion.

With regard to the psychology of conversation, an exchange of information for status, as described, would predict that lying and hogging the floor would be frowned upon but that remaining silent would not. It would also predict that it is the speaker who is responsible for making communication easy and possible, something that Sperber and Wilson's Relevance Theory (1986) argues to be true. And Hurford's computational model (2003) shows that if communicative success is the criteria for selection then synonymy should be rare and homonymy tolerated. That all of these facts are true is a hint that we are on the right track: the world *could* be otherwise (for example, homonymy could be rare and synonymy tolerated); that it is not is suggestive.

motivation for listening here: there are other benefits, over-and-above any transfer of information, to be gained from access to society's elite. These may be, for example, the opportunity to make them aware of your own concerns and priorities, or perhaps simply to announce to others, at a later date, that you were in their company.

The results of a number of recent studies provide empirical support too. For example, we should also expect that speakers who are better able to maintain the attention of others through the medium of speech are those that are held in the highest regard.¹⁷ This prediction has received independent and repeated corroboration from a series of anthropological studies. The result is an impressive array of cross-cultural consistency that includes the big men of Papua New Guinea (Lemonnier 1996, Strathern 1971), the Maoris of New Zealand (Salmond 1975), the Semai of Malaya (Dentan 1979), the !Kung of the Kalahari desert (Lee 1979), the Benkulu of Indonesia (Fessler 1999), the Kuma, also of New Guinea (Reay 1959, Howe 1986), and others. Furthermore, a correlation between eloquence and social standing is observed in many different strands of modern societies, from urban townships in the West Indies (Abrahams 1970) to US political circles (Hart 1987): "it is clear that one's standing in a group is influenced by verbal loquacity [sic], whether on inner city streets or corporate and government organisations" (Locke & Hauser 1999, p.154).

Turning to the more abstract notion of attention, Chance (1967) reports that, in a variety of different species, dominant individuals were often the foci of others' attention. This observation was formalised by Chance and Jolly (1970), who suggested that the attention-holding capabilities of a primate place it at the centre of the group. Locke (2001) observes that this behaviour is now also well-documented in humans, both adult and child: dominant

¹⁷ It should be made clear that although I have argued, following Dessalles (1998), that status, or prestige, is a possible consequence of maintaining attention, this is not the only outcome, and nor is it the only way by which status could be ascribed. Other outcomes might include, for example, advertisement of one's concern for another, or a display of power and strength. Both of these examples would, in different ways, contribute to the maintenance of one's social relationships, a commonly observed use of language (cf Dunbar 1993, 1997).

individuals receive far more gazes from others, especially during the act of speaking (Abramovitch 1976, Exline et al 1975).

In a survey of attention structure, Hold-Cavell (1996) concludes that “when looking for an index of status, attention directed toward group members is a better measure than any of the dominance indices... such a hierarchy does not exist only in the mind of the scientific observer; groups members behave as if they recognise the status of the other person” (p.24). It seems clear that a relationship exists between attention and status, or high-regard. The reasons for attending to a high-ranking individual seem self-explanatory: “high-ranking group members may... attract the attention of the others because they are potentially frightening, popular and/or interesting” (ibid, p.23-4). Could the reverse also be true? That is, could an individual’s ability to maintain attention *thereby* increase its status?

Evidence from studies of attention structure in school- and preschool-aged children suggests that it could. Hold-Cavell and Borsutzky (1986) studied videos of over 500 instances of schoolchildren being the centre of attention (defined as being looked at by three or more other children simultaneously). Vocalisation typically preceded the looks, and children who attracted attention to themselves at the beginning of the school year were more likely to be of high rank at the end of the year. Abramovitch (1976) has made similar observations. Moreover, Hold-Cavell (1986) lists attention seeking as one of two particularly important strategies for raising one’s rank (the other is coalition forming, a strategy that is also well-observed in primate societies). Importantly, vocalisation may not be the only medium by which attention is achieved. Food, or objects of interest, like toys, may also be used as tools by which to attract attention; “in short,

children who are successful in climbing up the hierarchy use food or objects to attract attention and make themselves interesting and attractive to other children" (Hold-Cavell 1986, p.26-7).

There is evidence that a similar process can occur with adults too. As Locke (2001) reports, controlled studies have consistently concluded that individuals who speak in long, multi-word sentences, or who are otherwise able to hold others attention' for prolonged periods, are perceived as more powerful than those who produce shorter, less complex utterances (Dabbs & Ruback 1984, Kendon & Cook 1969, Mulac 1989). Furthermore, in many societies good storytellers are held in high regard. Yet good storytelling requires not just a good story but also good *telling*: style, or eloquence, may add to the attention-maintaining capability of a story. For example, in the Limba of northern Sierra Leone, the narrator "enacts the tale, depicts the action with more, or less, characterisation, mimicry, exaggeration, and effect through the use of tones, length, speed, singing, or onomatopoeia in order to make his narrative vivid, attractive, and amusing to his audience" (Finnegan 1967, p.93). This is not to say that mindless fooling around is sufficient to maintain another's attention; rather, such devices can be – and are – used to enhance the attention-maintaining capability of utterances. Individuals that are able to do this – good storytellers – are thus held in high esteem.

Among primates, we can presume that notions of eloquence and loquacity do not carry meaning. Thus, a simpler measure of attention – frequency of vocalisation – might be expected to correlate with status. Indeed, volubility is sometimes used as a proxy indicator of status in humans (Fisek & Ofshe 1970, Kalma 1991). The results support the claim: a correlation between volubility and status has been empirically observed among both

vervets (Locke & Hauser 1999) and baboons (Kitchen et al 2003). Furthermore, “periods of continuous or oscillatory attention [in primate societies] link the individual’s internal state of preparedness for social action... [and] thereby... to its place in the society” (Chance & Jolly 1970, p.175). We have already seen that the stability of Zahavi’s generalised model of prestige depends upon high status individuals being willing not simply to remain within the society but also to act according to that status; that is, they are expected to perform acts of social good. This is the phenomenon that Chance and Jolly describe in primate communities.

If the provision of relevant information is a way by which attention can be maintained, and that by doing so one is granted greater status, then we should find a statistical correlation between the volume of information shared and status. In addition, if information sharing is a Zahavian handicap then we should expect that those who hold high-status will give more information away than low-status individuals. More generally, we should expect that an increase in status will be followed by an increase in information sharing, and conversely that a decrease in status will be followed by a decrease in information sharing. Whilst this has not been empirically researched as yet, Hardy and van Vugt (2005) have tested these predictions in generalised terms, using public goods dilemma games – where the goods shared are not information but some other item of value – with small interacting groups. In two studies they found that when behaviour was visible to all group members those who behaved most altruistically – that is, shared the most goods – gained the highest status within their group and were most frequently preferred as future interaction partners. Further experiments showed that those who held high status in a group shared more than those with low status and that an increase in status was followed by an increase in sharing and vice versa.

Although the currency in question here is not information, there seems no obvious reason not to suppose that the results would generalise to that domain. Certainly, investigation of such a possibility would be an interesting research project. After all, in section one I described how information is a fundamental need of humans, and how we depend upon others for much of that information. Why, then, should results demonstrating the consequences of sharing valuable goods not apply to information?

Taken together, this evidence supports the assertion made at the beginning of section four that both *content* and *eloquence* can maintain attention. One or the other may be sufficient, but both together form the most compelling attraction. This concurs with our everyday experience: we give credit to a dull but informative speaker, just as we do to a charismatic one even when the content of their utterances is forgettable. But we save our most fervent admiration for those who can speak informatively and charismatically about topics we deem relevant.

Finally, we should take note of etymological clues that point to a relationship between attention and high rank (Hold-Cavell 1996): 'high regard' comes from the Roman *wardare*, which also produced the English *guard* and French *garder*; and 'respect' comes from the Latin *spectare*, which means to look at, or to watch. In German *ansehen* (a verb) means to look at and *Ansehen*¹⁸ (a noun) means respect. The same relationship is found in Swedish *anseende* and in other branches of the Germanic language tree (eg Dutch). Finally, the Eipo of the West New Guinea highlands talk of those of high rank as *dildelamak*, meaning that they are looking at him (Eibl-Eibesfeldt 1984).

¹⁸ Note that nouns are always capitalised in German.

Thus, there a wide range of evidence, from a diverse range of fields, that lends support to the claim that individuals vocalise in order to attract and maintain attention, because by doing so they can, amongst other things, enhance their standing within the group. But why is enhanced prestige a fair payoff? That is, does increased status bring about evolutionary gain? Is the pursuit of status adaptive behaviour? These questions are the focus of the next section.

Section six: why accept status in return for information? The evolutionary benefit of status.

I have proposed, building on an idea of Dessalles' (1998), that conversational behaviour – most notably our willingness to share information – is the result of individuals attempting to capture and maintain others' attention, a process by which they gain evolutionary benefits, most notably increased status within the group. This section reviews the evidence that such benefits are associated with greater and fitter offspring.

What is status? As Henrich and Gil-White (2001) point out, an accepted definition has not been agreed upon within the social sciences. Whilst some scholars do distinguish between terms like *status*, *prestige*, *power* and *dominance*, others do not (see Henrich & Gil-White 2001 for an overview). Within archaeology there is a common division between *ascribed* status and *acquired* status (Renfrew & Bahn 1996), but in general it is fair to say that the term *status* has a variety of different uses. For our purposes, I accept the delineation made by Henrich and Gil-White between *prestige*, or *status*, as something that is freely conferred, and *dominance*, which is achieved through force, or the threat thereof. I make this distinction because our theory argues that status is *conferred* by others as a result of their use of language, not that it is *enforced* upon others.

How might we characterise status? The notion is fundamentally tied to that of hierarchy. To say that one individual has high status is to

say that another has low status: our standing is defined relative to others', and not on some independent scale. We cannot, therefore and by definition, all be of high status. The terms of that hierarchy – standing, prestige, respect, eminence – are somewhat intangible, but equally such a hierarchy is a human universal (Eibl-Eibesfeldt 1989): it exists in all known human societies. In addition, in matters of social interaction, status requires for its existence a relatively stable acquiescence, begrudging or otherwise, from whoever is lower in the hierarchy. Otherwise a status hierarchy is indistinguishable from a simple tabulation of frequent winners and losers (Weisfeld & Beresford 1982).

In fact, in the context of our discussion, the intangible nature of status should be emphasised. Status has no physical manifestation; instead, one's status exists only in the minds of others. No person "has" status until conferred it by another. It cannot exist independently of a relationship between two individuals. Consequently, status is a spatially constrained characteristic; it is not something we can carry from one society to another. Frank (1985) has emphasised the importance of, and our predisposition with, "choosing the right pond"; that is, seeking status in an environment that plays to one's strengths. In an evolutionary light, this is unsurprising. As Frank himself observes, "Darwinian theory has always stressed the importance of local environments in shaping the evolutionary paths of behaviour" (ibid, p.32). This is particularly relevant to the idea under discussion because it ensures that those credited with high status remain in the environment that granted them such prestige. Indeed, Nettle and Dunbar (1997) have asserted that the medium of speech, in the form of regional dialects, may have served as "an important index of social allegiances..." and that "...this indexing could well be important in the maintenance of group cohesion" (p.94). As we have seen, the

spatially constrained nature of status is a necessary part of the mechanism by which information sharing remains evolutionarily stable.

Turning now to the data, an empirical link between status and reproductive success is not yet firmly established, though this seems to be due more to unclear data than to any other reason. A defining feature of human status hierarchies is the existence of many different skill/prestige categories (Barkow 1989): any given individual may be highly ranked in one category but be more lowly in another. Thus, the data on status and reproductive success will be necessarily complex. Furthermore, many studies (eg Betzig 1986) have focused on the relationship between reproductive success and *power*, rather than *prestige* or *status*, and as such are unsuitable for our purposes, for reasons previously discussed: power is often the result of *dominance* rather than freely-conferred prestige.

Nevertheless, a link between status and reproductive success appears to exist, as expected. Hill (1984) surveys ten societies and concludes that in eight of them we see just such a correlation. Of the remaining two, in one (the Tlingit, an Alaskan potlatching people) the data on reproductive success was very poor and for the other (modern British peerage) Barkow (1989) mounts a convincing case that modern cultural influences will have granted women greater control over their own sexual behaviour and fertility, and consequently this will upset the standard correlation. Certainly, the unique ethnology of modern society renders its potential status as an outlier unsurprising. To Hill's data we might also add Perusse's demonstration that high-status men in Quebec have greater access to women of reproductive age than those of lower status (1993).

A relationship between *wealth* and reproductive success is, however, well-established: correlations between wealth and fertility have been found amongst Persian Yomut Turkmen (Irons 1979), Venezuelan Yanomami (Chagnon 1980), rural Trinidadians (Flinn 1986), the Mukogodo of Kenya (Cronk 1991), the Hausa of Nigeria (Barkow 1977), the people of 18th-century Lancashire (Hughes 1986) and many more.^{19,20} On the one hand, we might argue that wealth is a good proxy indicator of status; indeed, for many, including some scholars in the social sciences (eg Goode 1978), wealth is part of the very definition of status.²¹ After all, in the environment of modern *Homo sapiens sapiens*, for example, wealth is virtually synonymous with resources. However, on the other hand, Barkow (1989) argues that this is the “least interesting” (p.207) way of testing the expected correlation, because in all the societies surveyed above wealth is valued, and as a result any man who can accumulate the necessary wealth will probably be polygamous. The equivalent scenario for women will be necessarily more complex, for obvious reasons, but the central point, that wealth allows a luxury of choice over reproductive behaviour, still holds. On balance, then, we should consider the data correlating wealth and reproductive success an underscore to the previously discussed results, rather than as an additional support for the idea being tested.

In non-human primates the data is clear. Gray (1985) and Cowlshaw & Dunbar (1991) survey several studies in which rank correlates with either reproductive or mating success, including, for

¹⁹ To allay any potential criticism: none of the examples listed here are despotic. That is, none place agonism at the centre of their status hierarchies; none are examples of the *power* hierarchies discussed above.

²⁰ For further references, see Scheidel 2000.

²¹ It could be objected that there are, arguably, some notable exceptions. In some societies, those that give up all claim to worldly goods are highly respected; for example Indian fakirs. We can, however, consider these an anomaly: not only are they rare exceptions, but the very reason that such individuals are respected is that they have acted against the usual human instincts; the very same instincts that have shaped our evolution.

example, Altmann and colleagues' surveys of baboons (1988, 1996). We should also note that levels of the hormone serotonin are closely correlated with status not just in humans and primates (Larson & Summers 2001, Raleigh et al 1991) but in many other species too (eg Edwards & Kravitz 1997). Though we should be wary of drawing firm conclusions from neurophysiological evidence – the causes of psychological phenomena are complex and multifarious – such similarities do allow us to have more confidence in the relevance of primate status hierarchies to the case of humans.

Although, then, the evidence is not overwhelming, equally it is sufficiently compelling for us to accept, as a working hypothesis, that higher social status ultimately brings greater reproductive success. This should not be a surprise; after all, status, or rank, is something that concerns us all, sometimes a large amount of the time. De Botton (2004) considers it a human predisposition and Eibl-Eibesfeldt (1989) argues that is one of only a few such predispositions shared by all humans. Given this ubiquity, it would be a surprise if a quest for status were nothing more than a by-product of some other adaptive trait; a spandrel (Gould & Lewontin 1979), in other words. It seems reasonable to argue that if an individual's ability to maintain attention through the medium of language confers upon them increased standing within the community, then such an ability will be selected for over evolutionary time. Indeed, several evolutionary explanations of why and how status hierarchies might come to exist have been proposed (eg Barkow 1989, Perusse 1993, Zahavi 1995, Henrich & Gil-White 2001). I do not wish, here, to digress onto discussion of the merits of these explanations; for now, I remain agnostic on the issue. Rather, I wish simply to make the point that if information sharing induces increased status then it is reasonable to characterise such behaviour as an adaptive trait that will be

selected for. We thus have an explanation for our willingness to share information.

Section seven: concluding remarks

Pragmatics is a neglected component of language evolution research. This is puzzling, since it represents the branch of linguistics that deals with behaviour, and behaviour is a core concern of Darwinian thought. One such neglected issue is why humans willingly and pro-actively converse with each other. Brief consideration of that question produces a paradox that is not easily resolved by existing theories of language evolution: that such behaviour is altruistic, but that natural selection acts against such outcomes.

Two computational models were considered as possible explanations. However, neither was suitable. Kameda et al's model (2003) was shown, upon close inspection and contrary to its claims, to fail in its efforts to explain why social goods are shared. It was thus deemed unsuitable for adaptation to the case of information. Similarly, the conclusions that Čače and Bryson drew from their model (2004) were unjustified: where they claim to have modelled a scenario in which information is willingly shared, what they have in fact modelled is kin selection.

Only a few scholars have acknowledged the paradox described above. Implicit within it is a naïve assumption that the listener receives most, if not all, of the benefit from conversation. However, our analysis suggested the opposite to be true: that the speaker is the principal beneficiary of conversation, and that the information supplied is a payoff that the speaker must offer in order to maintain

the attention of others. And it is by doing just that – maintaining attention – that the speaker receives the payoff, first suggested by Dessalles (1998), of enhanced status, or standing, within the group.

Several questions, and associated research topics, present themselves. Computational modelling techniques would be appropriate tools to discuss two of the phenomena that arise from the scenario sketched above. Firstly, we might ask what predictions are made when we consider valuable information as a currency that can be 'spent' several times over, but only once with each conspecific. And secondly, if reduced status is the consequence of producing *irrelevant* utterances, then might a variety of conversational strategies emerge, in which some individuals choose high-risk, high-gain strategies and others opt for the low-risk, low-gain equivalents? An empirical project is also suggested. Hardy and Van Vugt (2005) found that individuals who share more general public goods with others were perceived as being of higher status. Does this result generalise to the case of information? A controlled study of this kind would, if the central claim is supported, provide further empirical support for the idea I have presented.

Furthermore, motivation is provided for exploration of precise nature of the relationship between status and attention. Whilst I argue that the ability to maintain the attention of others' will result in increased status, equally those of high status seem to attract more attention than others. Thus, the two qualities might be expected to iteratively reinforce each other: attention-holding brings about status which, in turn, produces more attention-holding possibilities. It would be of interest to explore whether or not this prediction is supported by the data.

Finally, what other questions in language evolution might our theory shed light on? If the maintenance of attention through the medium of speech is adaptive behaviour then we might expect there to be a pressure for some sort of linguistic creativity; for the application of techniques that enhance one's ability to hold the attention of others. Could this pressure explain the evolution and emergence of various linguistic phenomena? For example, could such a pressure act to select individuals able to produce a wider and more diverse range of utterances, and could that process explain the evolution of the human vocal tract? These are very speculative matters, but they deserve exploration.

I conclude by quoting Locke, whose contribution to the topic of language and status was as influential in my thinking as that of Dessalles'. He says: "knowing something that others did not increased one's ability to compete, through the medium of speech, for rank and relationships. When hominids spoke, they did so because it would alter what their listeners thought about, aware that if they did it well, it would alter what their listeners thought about them" (2001, p.46).

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