# A Systemic Functional Approach to Language Evolution

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*An approach to interpreting possible steps in language evolution is offered here from systemic functional linguistic (SFL) theory. SFL models language at three levels from sounds to wordings to complex patterns of social discourse. Typological studies in this framework have shown striking commonalities at each level across languages, that are not yet adequately accounted for by existing models of language phylogenesis. Four conditions are suggested for developing explanatory models that may account for these linguistic phenomena. These include (a) a mechanism for reproducing complex cultural behaviours intergenerationally over extended time, (b) a sequence by which articulated wordings could evolve from non-linguistic primate communication, (c) extension of the functions of wording from enacting interpersonal interactions to representing speakers' experience, and (d) the emergence of complex patterns of discourse for delicately negotiating social relations, and for construing experience in genres such as narrative. These conditions are explored, and some possible steps in language evolution are suggested, that may be correlated with both linguistic research and archaeological models of cultural phases in human evolution. The aims of the article are to offer some useful tools to the field of language evolution, at the same time as indicating potential interpretations of existing work, using insights from SFL research.*

Current models of language evolution are informed particularly by formalist linguistic theories (e.g. Bickerton 1990; Chomsky 1986; Li 2001; Lieberman 1998; Pinker & Bloom 1990). The analytic focus of formalist linguistics is on grammatical structures of sentences and phrases, and sound segments that articulate words. The perspective from structural forms directs attention to the evolution of anatomical potential for articulation, and posits neurological mutations in human evolution, to explain features of sentence, phrase and word structures that are seen as universal across languages. There is disagreement in the field over the timing of this event: whether all language structures were genetically 'hard-wired' in ancestral brains simultaneously, or in stages (e.g. first words then sentences, then phrases). Significant questions that are not yet resolved by this approach include:

- Whether modes of communication in early *Homo* were more like those of primates or more like modern human language consisting of words. What functions might they have served?
- How and when articulated speech originated. Would it have consisted of sentences, phrases and/or words? And what were the conditions that selected for it?
- Whether the first anatomically modern humans had modern language capacities. And why the cultural complexity of the Upper Palaeolithic seems to emerge only long after their first appearance.
- The nature and origin of 'universals' across modern languages. Are they more likely to have evolved independently in separate regions or from a common source?

An alternative approach that may shed light on these and other questions is offered here from systemic functional linguistic theory (SFL), that has developed from the work of M.A.K. Halliday (Halliday 1994; Martin 1992; Martin & Rose 2003). The SFL conception of language is a set of resources that enable speakers to exchange meanings. It is centrally concerned with

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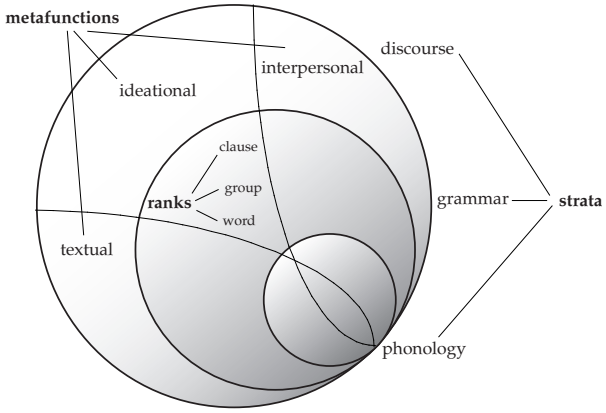



**Figure 1.** *Dimensions of the SFL language model.*

relations between language and its social contexts of use, and a highly articulated set of tools have been developed for describing these relations. SFL is a rich model of language that requires some initial discussion.

Firstly, language achieves an indefinitely large, rich, variety of meanings by weaving together multiple layers of structure and function into every instance of communication. To describe this complexity, SFL models language in four dimensions, known as metafunction, stratification, axis and rank. **Metafunction** describes three broad functions of language in social contexts: 1) enacting social relations between speakers (interpersonal functions); 2) construing our experience of activities, things, people, places and qualities (ideational functions); and 3) presenting discourse so that it is meaningful in context (textual functions). **Stratification** describes three levels or strata of language: social discourse, which is realized as grammar (wordings), which is realized as phonology (soundings). **Axis** describes complementary perspectives on language a) as systems of potential meanings available to speakers at each stratum and b) the actual structures of speech that are produced from these potentials. SFL is interested in both how meaning systems are organized in a language, and how they are enacted as speech structures. **Rank** describes layers of structure within each stratum, such as the sentences, phrases and words of formalist theory. However the term 'sentence' traditionally refers to a unit of written text, so 'clause' is widely used in linguistics to include spoken language; a clause equates with a simple sentence, such as *Some birds are flying in the sky*. The term 'phrase' traditionally refers to word groups starting with a preposition in English, such as the place *in the sky,* so the term 'word group' is often used to apply more broadly, to things like *some birds,* and to activities such as *are flying*. The SFL model is often illustrated as a set of nested circles as in Figure 1, in which a relatively small set of sounds realizes a larger set of grammatical patterns, which can realize a still larger set of discourse patterns.

This model is elaborate, but no more than theoretical frameworks in other fields, and certainly no more than language itself, which is an immensely complex phenomenon. If we want to understand how language originated, its complexity must be taken into account, as models of phylogenesis in other disciplines account for the complexities of physical, chemical and biological systems. Table 1 outlines how various components of the task of meaning-making are parcelled out in various regions of the language system. (Table 1 is intended as a useful reference and overview. It is not necessary to commit all these categories to memory before reading the paper, which is written to be maximally accessible across disciplines.) At the level of discourse are six systems of meaning, two within each metafunction (1–6). These discourse systems organize series of meanings, such as turns in exchanges, and sequences in stories, as waves of information. Within grammar there are systems at each rank of clause, word group and word, serving each metafunction (7–15). Within phonology there are also three ranks: the syllable, the rhythmic foot, and the tone group, which serve interpersonal and textual, but not ideational functions (16–19). All these systems are drawn on simultaneously in the process of communication.

To make the different theoretical perspectives clear, domains of interest in formalist theories are indicated by shading in Table 1. Within these seven domains, SFL claims that grammatical structures of clauses, groups and words emerge from functions of construing experience and presenting information. In contrast formalist theories claim that grammatical structures are determined by non-meaningful rules of syntax, into which representational meanings are inserted. As grammatical patterns often vary between languages, rules of syntax are assumed to be arbitrary, i.e. unrelated to meaning. As they are not explained with reference to social function, they are assumed to arise from structures of the brain. Some regions of interpersonal and textual functions are recognized in formalist models, but are dealt with as 'pragmatic' or 'paralinguistic', lying outside the formal study of language as syntax. Part of the difference in language models derives from different data sets: SFL theory is founded on analysis of large-scale samples of discourse in social contexts, while formalist theory is founded on analysis of clauses extracted from discourse, or elicited or invented by the linguist. Although the language



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**Table 1.** *Language systems by stratum, rank & metafunction.*

| | **interpersonal** (enacting social relations) | **ideational** (construing experience) | **textual** (presenting meanings) |
|---|---|---|---|
| **Discourse** | | | |
| | 1. turn-taking in exchanges | 3. sequences of activities | 5. waves of information |
| | 2. evaluating feelings, people & things | 4. relations between people, things & places | 6. keeping track of people & things |
| **Grammar** | | | |
| ***clause*** | 7. type of exchange move: statement, question, command | 10. process with people, things, places & qualities | 13. starting point & new information |
| ***word group*** | 8. evaluating things & processes | 11. number, qualities & classes of things | 14. sequence of words in groups |
| ***word*** | 9. types & intensity of evaluating | 12. types of things, qualities & events | 15. sequence of word stem & affixes |
| **Phonology** | | | |
| ***tone group*** | 16. tone movement = type of exchange move: e.g. rising tone = question / falling tone = statement | - | 17. tone group = unit of information (words with major tone movement = new information) |
| ***rhythmic foot*** | - | - | 18. stressed syllables mark words & word groups |
| ***syllable*** | - | - | 19. cycles of vowels & consonants articulate words |

models are very different in these respects, there are clearly also commonalities. The model of language evolution developed here correlates with formalist proposals of staging from words, to clauses, to word groups; however, this staging is timed to later stages, and biological mutations are a less prominent factor in explaining it.

A central focus of SFL research is on language variation, on how speakers use language for different purposes in varying contexts. Contextual variations are theorized at two levels: firstly as differences between types of situations in which language is used, or 'genres' — such as conversation, narrative, procedure, argument and so on; and secondly as variations within each situation of speaking, including (a) relations between speakers, (b) the activities they are engaged in, and (c) the role that language is playing, e.g. as dialogue or monologue. The relation between social context and language is conceived as 'realization'; that is, social contexts are realized by language (i.e. 'manifested / symbolized / expressed'). Relations between language and social functions are thus claimed to be natural rather than arbitrary. This model provides a set of tools for describing the roles of language in culture that are highly attuned to differences within and between cultures; so they are ideally suited for testing hypotheses about functions of language in the stages of human evolution described by archaeology.

## Language typology: evidence of commonalities

A primary motivation for investigating language evolution is the problem of similarities and differences between contemporary languages. Language universals have long been recognized in grammatical structures of all languages (Greenberg 1978), the enigma that formalist theories attempt to explain neurologically. More recently etymological studies across language families have found words that may originate in a common ancestral language group (Ruhlen 1994). But functional language descriptions identify similarities and differences far beyond the structures of words and sentences, in the organization of systems and structures of speech at each stratum.

A wide variety of languages have been investigated using SFL methodology. One of these is the Australian language Pitjantjatjara, spoken by the *Anangu* people of Australia's Western Desert culture (in the region of Ayers Rock or *Uluru*), and the author's second language. Detailed analysis of the language has revealed a host of intriguing differences between Pitjantjatjara and familiar European languages such as English, in both the kinds of meanings that speakers make, and in the ways these meanings are expressed (Rose 1993; 1996; 2001a; 2004b&c; in press). Nevertheless, underlying these variations, striking similarities



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were also found in every dimension of the languages, from the overall organization of the languages as outlined in Table 1, to the smallest structures of speech and the meanings they express. These findings were surprising as Australian languages are a relatively homogeneous family that has probably been isolated from other language groups for at least 40 millennia (40 kyr), and that thus should form a benchmark for maximum possible variation between languages. They certainly challenge the claim by the formalist authority Dixon (1980, 238) that 'there is absolutely no evidence for a genetic connection between Australian languages and anything outside the continent; there is not even the remote "possibility" that scholars could argue about'; but then this dictum is predicated on the forms of syllables in which words are expressed, the lowest element in language (system 19), and the fastest to change.[1] All the same, even if there is a distant genetic connection between Australian and European languages, the ecosocial contexts in which they have separately evolved over 40 millennia could not be more different, and one might expect that they would come to mean in very different ways. But what the study showed were commonalities in systems and structures on the order of at least several thousands.

The discovery of extensive commonalities across these domains in Pitjantjatjara and English have led to comparative studies across a representative range of languages from Australia, Eurasia, Africa and the Americas, focusing on discourse patterns in stories. This research has so far pointed to a common set of discourse patterns across all the sampled languages, realized by a variable but finite set of grammatical strategies (Rose 2001b; 2005a). These findings are also supported by functional language descriptions in Caffarel *et al.* (2004), that display comparable grammatical patterning underlying rich diversity between languages. While this typological research is still in its early stages, the commonalities it points to demand plausible functional explanations. It is the intention of this article to offer some indicators for how such explanations may be developed.

To illustrate the kinds of higher-level commonalities found in this research, and to provide a platform for the discussion of language evolution, two common genres are described here, firstly a negotiation between a group of people about a planned activity, and secondly a traditional narrative. The negotiation illustrates interpersonal patterns of discourse, while the narrative illustrates ideational and textual patterns. The descriptions are grounded in the cultural contexts in which they are spoken, as follows. The Western Desert culture bloc includes less than ten thousand members who traditionally hunted and gathered across an arid region the size of western Europe, with a population density of 1 per 80–100 km$^2$ (for evocative descriptions see Myers 1986; Tonkinson 1978). Western Desert society is organized by marriage exchanges between kin groups across great distances. Betrothals take place in the context of large-scale religious ceremonies, in which youths are initiated into the secret-sacred rituals of the *Tjilkatja* 'Men's Law'.[2] Initiating rituals are performed by their betrothing fathers-in-law or brothers-in-law, consecrating the inter-group relationship created by betrothal and marriage in view of all. As a result both parties are socially obligated to provide access to resources when called upon. In the climatic conditions of the desert, with low, unpredictable, usually highly localized rainfall, and frequent droughts, this system ensures resources are continually available to all kin groups over a vast territory, with minimal fear of conflict.

Underpinning these relations of production is an Indigenous Australian ideology that has been referred to as 'egalitarian mutuality' (Maddock 1972). This includes strong sanctions against material inequalities between peers and kin groups, maintained by reciprocal exchange relations. Such egalitarian reciprocity is widely reported as a feature of hunter-gatherer cultures in general (and remains an ideological trend within stratified mass societies). Whallon (1989, 144) suggests that it originates in cultural adaptations to scarce resources, that may have triggered the so-called Upper Palaeolithic revolution in social organization and symbolic activity observed throughout Eurasia and Africa, as well as Australia, from around 45–40 kya.

> Probably many of the factors that significantly select for egalitarian organization in human societies are related to conditions of relatively low resource density and hence relatively low population density — the conditions in fact under which major Upper Palaeolithic demographic expansions occurred ... As at least roughly equal access to resources becomes of greater importance in the adaptation and survival of the population, egalitarian organization concomitantly becomes more advantageous ... and especially so as these resources become less predictable in spatial or temporal availability.

## Negotiating kinship

Western Desert peoples represent the structure of their society in religious paintings, such as Figure 2, as large systems of exchange networks between kin groups. Generations within groups are symbolized by concentric circles and relations between them by parallel lines.



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In such a system, where survival depends on reciprocal obligation between groups exchanging marriage partners, conflict between their members must be avoided at all costs. To this end, a set of specialized interpersonal language resources are used between brothers-in-law, to avoid any intimations of domination or social distance. These include repetitions of positive affect, enacting a close personal relationship, but at the same time avoiding any direct commands or direct reference to the other speaker, scrupulously enacting relations of mutual deference. These kinds of language resources are also used to various extents in other relationships, where speakers wish to enact mutual respect. An example is the following exchange (1) between four speakers, including an older woman, her sister-in-law, her daughter-in-law and a classificatory son, i.e. a man who is not an actual family member, but is classed as her son in the desert kinship system. The older woman, denoted here as Mother, wants the group to go out gathering wild fruits in the morning, and sets out to persuade them to her plan. Her strategy is persuasion rather than commanding because the interactants are her equals, and within the constraints of the kinship system, their relationship as in-laws and adults demands mutual respect. The tones on which moves are spoken are shown in the first move with lines, a low falling tone ⟍ and a rising tone ⸝.

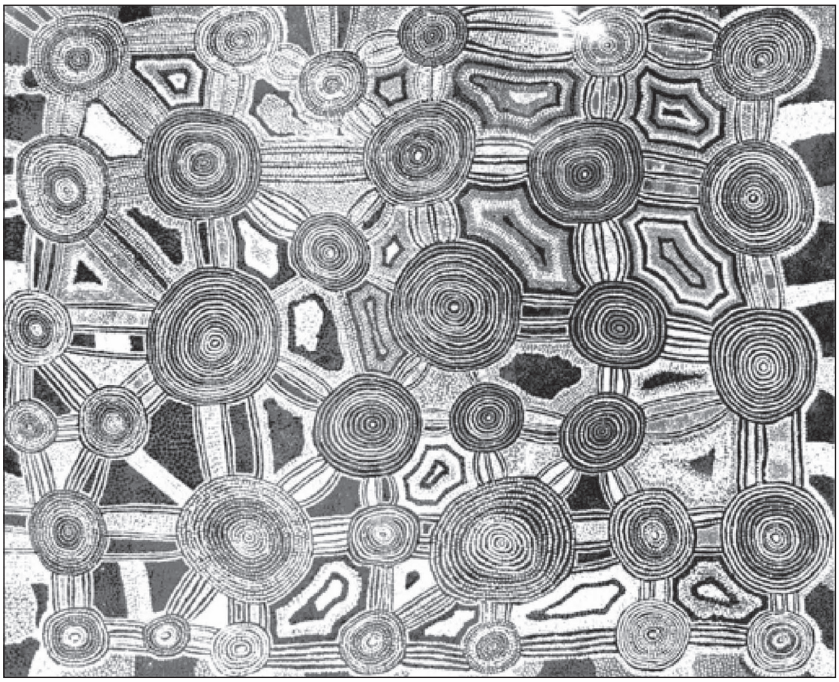


**Figure 2.** *Western Desert society as exchange networks. Kaakunatintja, Uta Uta Tjangala* (courtesy the artist and Museum of South Australia).

(1)

*Mother*
Perhaps in the morning we can gather honey ants, shall we?

*Son*
Yes, definitely!

*Mother*
Tomorrow morning in the daylight, we can go gathering, and we'll show the children how to do it too.

*Sister-in-law*
Let's head for the acacia bushes where honey ant nests are found.

*Mother*
For the acacia, and bush plums as well. Maybe we'll get wild figs. If you go over there you could gather and bring back plenty very quickly.

*Son*
Over there, lots of wild figs come out. [indicating direction]

*Sister-in-law*
Yes.

*Mother*
That's true!

*Daughter-in-law*
No, not there, over here! [indicating opposite direction]

*Mother*
Let's go over here [Daughter-in-law's direction] and have a look. Maybe there are plenty in this place.

*Daughter-in-law*
That is the other day my son dug up and gathered plenty.

*Mother*
There are wild figs here, so let's go and look. Plenty of wild figs are there, so let's gather and bring them back — wild figs, and what else? — bush plums. We'll gather bush plums. Halfway along the road there's certainly a lot! And as well let's get sweet grevillea flowers.

The mother's first move is a very oblique suggestion, using five strategies for opening it up to negotiation:

1. Instead of a command, it is phrased as a statement, as though she were giving information rather than demanding an action.
2. 'Perhaps' further lowers the obligation implicit in the suggestion.
3. Instead of the obligatory 'should' she uses 'may'.
4. Instead of the high falling tone typically used for commands, she uses a low falling tone typically used for statements.



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5. A response is invited by the tag question 'may we?'. This combination of strategies conspires to downplay any implication of obligation in the suggestion. They draw on all the interpersonal systems in Table 1, from turn-taking (system 1) through types of exchange moves (7) and evaluating (2, 8, 9) to tone movements (16). Only when the Son responds positively does the Mother start proposing her plan, and as her Sister-in-law adds a positive suggestion, her plan is elaborated. Unfortunately the Son then suggests where to go, which is not where she had in mind. But as an adult male, she and her Sister-in-law are obliged to agree with him to maintain solidarity and respect. Fortunately her Daughter-in-law is under no such constraint with her husband's classificatory brother (her classificatory spouse), and directly negates his suggestion. This gives the mother the opportunity to agree with her Daughter-in-law, and expand her plan, without risking her own relationship with the Son.

Of course in the transcript here this all takes place in English, which is the point (for the full text see Rose 2001a; in press). The kinds of elaborate resources the Mother uses here for delicately negotiating status and contact are recognizable in any culture, known colloquially as 'polite speech' (Brown & Levinson 1987). Below is her first move in the original Pitjantjatjara, displaying the same five resources for backgrounding obligation in her suggestion, and opening it up for negotiation.

| *kuwari-nti-la* | *mungawinki* | *tjala* | *ura-lku* | *mulapa* |
|---|---|---|---|---|
| now-maybe-we | morning | honey.ants | gather-can | really |

Perhaps in the morning we can gather honey ants, shall we?

The words and their order differ between the languages, but their functions are virtually identical, as are the falling and rising tones. The key resource the Mother uses here is known as **interpersonal metaphor** (Halliday 1994; Rose 2005b). In metaphor in general, one kind of wording is used to symbolize a different kind of meaning, such as *Keep your eye on the ball*, in which the words *your eye* symbolize the meaning 'watching closely'. With interpersonal metaphor, one kind of interpersonal wording comes to symbolize a different kind of exchange move. For example, a demand for speaker and listeners to act together is normally expressed as a kind of command, in English with 'let's' *Let's all gather honey ants!* But here the Mother's initial demand is expressed metaphorically as a statement *We can gather honey-ants*, as though she were giving the listeners information, rather than demanding they act; and she then tags it with a question, as though she were asking for information.

Interpersonal metaphor is a major feature of 'polite speech' across cultures, as illustrated here for Australian and European cultures. Speakers often consciously employ it to delicately negotiate social status and social distance, prototypically by re-expressing a command as though it were statement or question. Direct commands imply an asymmetry of status in a relationship, and such implications may not be desirable where status and distance require more delicate negotiation. Presenting a command as though it were a statement or question, positions addressees as knowers rather than as actors (cf. Martin 1992; Eggins & Slade 1997), thus conferring the social status of authorities rather than servants. From the perspective of unfolding interaction, interpersonal metaphor provides a rich set of resources for negotiating. Here the Mother starts her proposal with interpersonal metaphors, but as the others' responses lend support, she shifts towards direct demands. These patterns are diagrammed as turn-taking in Figure 3. As the negotiation unfolds, the obligation in the Mother's proposals build from LOW (interpersonal metaphor) to HIGH (direct demands), and the supporting information she gives builds from VERY UNCERTAIN to VERY CERTAIN.

Interpersonal metaphor is a qualitative leap in meaning potential, but it also involves a cognitive leap. Metaphor requires speakers to correlate a wording both with its usual literal meaning, and with the new transferred meaning that it symbolizes. An effect of this cognitive complexity is that children typically learn to use interpersonal metaphor only as their social relations widen beyond their immediate kin group. In pre-industrial societies such as the Western Desert, this

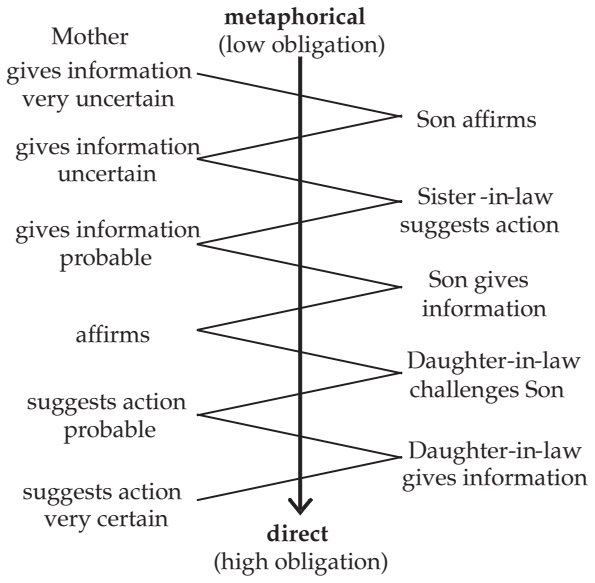



**Figure 3.** *Negotiating action in exchange (1).*



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often occurs as a child approaches the age for betrothal, when they must begin to interact with adults from distant groups, particularly potential in-laws. From the individual perspective, it enables exchanges with relative strangers; from the cultural perspective it enables exchange relations between distant groups, from marriage exchanges to international diplomacy. That is, the same interpersonal resources that can be translated from language to language in global diplomatic negotiations are no different in kind from those employed for delicate negotiations in small-scale societies.

Interpersonal metaphor is part of a suite of discourse resources, perhaps shared by all languages, that enable the kinds of social relations that characterize complex human social organization. A crucial feature of this complex social organization is ideology. For example, the ideology of egalitarian mutuality emerges from the reciprocal exchange relations selected for by hunter-gatherer modes of production. However ideology is not a content of discourse, but a principle of social and conceptual organization (Bernstein 1996). It enables human societies to reconstrue biological categories, such as *male/female*, *elder/younger, kin/not-kin*, as social categories. By this means, a biological category such as *not-kin* (and therefore potential competitor for resources) can be reconceptualized as a semiotic category within a kinship system, enabling biologically unrelated individuals and groups to negotiate exchanges as if they were kin. And it is through elaborate language resources that humans are able to do this, as Vygotsky (1978, 40) found, 'The use of signs leads humans to a specific structure of behaviour that breaks away from biological development and creates new forms of culturally based psychological processes'. Other primates cannot do so and so are constrained to interact with others according to their biological imperatives. Ideology in these terms is a purely human phenomenon.

But to function as an adaptive strategy for the reproduction of a society, ideology must itself be reproducible across generations. One way this is achieved is through religion, which consecrates the exchange relations constituting the social system (Durkheim 1976). This consecration has two primary modes: one is the religious rituals and songs that submerge each member of the society in a united emotional experience; the other is the system of narratives that encode the society's cosmology, its stories.

## Stories

Stories have evolved to perform a complex set of pedagogic functions, from exchanging useful information between peers, to apprenticing children to their society's behavioural norms and ideological principles (Bruner 1996; McNeil 1996). They confer adaptive advantages on a speech community at three general levels. First, they enable members of a kin group to share personal experiences with each other, for the purposes of informing, entertaining or gossiping. Secondly, stories can accrue higher social value by repeated retellings across a whole community, if they evoke a significant message or emotional reaction, or model normative behaviour. Thirdly, stories may transform into religious myths through innumerable retellings over generations across a whole society. At each level stories encode ideological principles of social and natural order. But myths have evolved to encode ideology in highly structured patterns (Dumézil 1968; Lévi-Strauss 1970–78). They function to reproduce this esoteric information over deep time, and so are subject to the most exact replicating fidelity, in concert with religious songs and rituals (Steadman & Palmer 1997).

Stories construe sequences of activities involving people, things and places, but they do so in such a way that their content does not depend on the speaking context. Rather they construct their own context as they unfold, so that listeners are able to enter the imaginary reality they construe. The following example is a brief extract (2) from a Pitjantjatjara story about the origin of giant mythic serpents known as *wanampi* (full text in Rose 2001a). At the start of the story, two brothers were married to two sisters. The story at this stage encodes the sexual division of labour in Pitjantjatjara culture with the brothers heading up the hills for game, and the sisters descending to the plain for vegetable foods. Each line in the transcript is a clause realizing an activity. The line below translates each word in groups, and the third line translates the whole clause.

(2) *Piltati* story[3]

| | | | |
|---|---|---|---|
| *wati kutjara* | *kunyu* | *kuta-rara* | *nyina-ngi* |
| man two | it's.said | brother-pair | sit-were |

There were two men it's said, who were brothers.

| | | |
|---|---|---|
| *kungkawara kutjara* | *alti-ngu* | *kangkuru-rara* |
| young.woman two | marry-did | sister-pair |

Two young women were married to them, who were sisters.

| | | |
|---|---|---|
| *wati kutjara pula* | *a-nu* | *malu-ku* |
| man two they | go-did | kangaroo-for |

Those two men went hunting for kangaroos;

| | | |
|---|---|---|
| *kuka kanyila-ku* | *tati-nu* | *puli-ngka* |
| game wallaby-for | climb-did | hill-on |

for wallabies they climbed up in the hills,



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*munu* *pula* *kuka kanyila* *kati-ngu*
and they game wallaby bring-did
and they brought back wallaby meat.

*ka* *pula* *mai-ku* *tjaru-ukali-ngu*
and they food-for down-descend-did
And the other two went down to the plain for vegetable foods,

*munu* *pula* *mai ili* *ura-ningi*
and they food fig gather-were
and they were gathering wild figs.

The *Piltati* story represents a sequence of events, unfolding in time and place, involving people in purposeful activities. Although this may seem self-evident, the narrative sequence only makes sense to us, in both Pitjantjatjara and English, through four systems of discourse patterns. These include:

- relations between words in succeeding steps (i.e. lexical relations — system 4);
- logical connections between events (system 3);
- keeping track of who is acting in each step (system 6);
- manipulating listeners' attention to information (system 13).

These patterns are summarized very briefly as follows.

First, lexical relations here are either similar (=) or contrasting (vs), including *two men=brothers* vs *two young women=sisters*, and *kangaroo=wallaby game* vs *vegetable food=fig food*. As well as maintaining relevance as the story unfolds, these semantic relations construct a contrast between the work of men (who ascend for game) and women (who descend for vegetable food).

Secondly, logical connections between activities either elaborate them (*there were two men =two women were married to them*; *those two men went =they climbed in the hills*). Or they add one activity to another (*they climbed up +and they brought back +and the other two went down +and they were gathering*). Such logical relations construe the sequence of activities and elaborate steps within it.

Thirdly, listeners keep track of who is who by means such as pronouns: *those two men-they-they*, *the other two-they*, and Pitjantjatjara also uses two different kinds of conjunctions that refer to different identities. The conjunctions *munu* and *ka* both mean 'and', but *munu* means the same person as before, while *ka* means a different person. English does this with comparison: *those two-the other two-the same two*.

Finally the listener's attention is drawn first to the beginning of each step, which here identifies who is acting: *two men-two young women-those two men-they-the other two-they*;[4] and then to the new information at the end of each step, including their roles, activities, things and places: *brothers-sisters-went for kangaroos-climbed in the hills-brought back meat-descended for vegetable food-were gathering figs*.

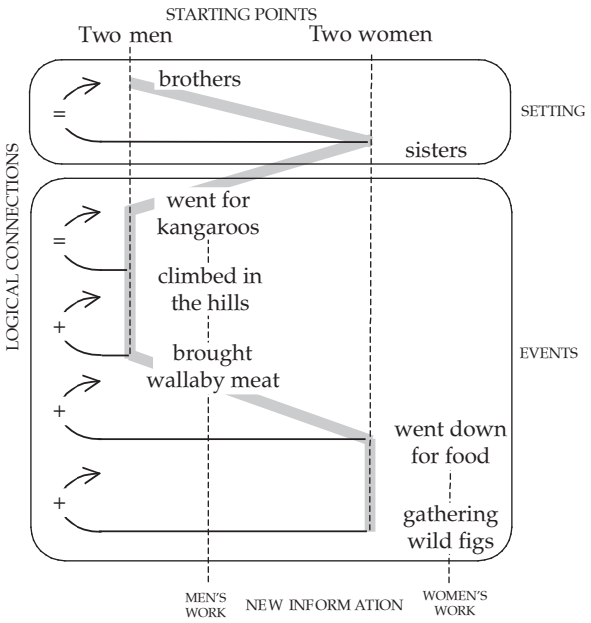



**Figure 4.** *Some discourse patterns in story (2).*

These discourse patterns are diagrammed in Figure 4. The sequence goes through two phases, or waves of information (system 5 in Table 1), a SETTING that identifies the people, and a series of EVENTS. Within each phase, each step is logically related to the one before, either adding to it (+) or elaborating it (=), thus construing the activity sequence. The actors in each step switch back and forth between the *two men* and the *two women*, identified in the starting point of each clause (as the speakers in exchange (1) switched back and forth in each turn). The new information in each step are their roles, activities, things and places, that contrast men's and women's work.

This brief sketch illustrates just a small fraction of the strategies Pitjantjatjara and English use to achieve complex discourse functions in stories. The strategies differ slightly but the discourse functions are identical, despite 40 millennia of separate development. How is this possible?

## Explanatory models: four conditions

Given the extraordinary complexity of these common patterns, neither genetic inheritance nor evolutionary convergence appear to be sufficient explanations. Hypotheses of genetic determination of language structures have become less tenable in the light of current



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findings in neurophysiology (Edelman 1992; Edelman & Tononi 2000). These indicate that the brain 'evolves' epigenetically in foetal and postnatal development, so that the neural structures of each individual are very different but become organized by social experience to serve the same functions. (For other critiques of genetic determinist hypotheses see Benson *et al.* 2002 on primate communication studies, Botha 1999 and Matthiessen & Nesbitt 1996 on linguistic method, Bruner 1996 on culture and language learning, Deacon 1997 and Edelman & Tononi 2000 on structure and development of the brain, MacNeilage & Davis 2000 on the physiology of speech, and Painter 2004 and Tomasello 2000 on child language development and evolution.) A weaker version of the genetic hypothesis is that languages come to mean in similar ways as speakers share a common biology in similar environments, but growing evidence of shared complexity suggests that independent convergent evolution on this scale is unlikely.

An alternative to such speculations is historical descent, the accepted explanation for commonalities within language families up to 5–8 kya, the presumed ages of families such as Indo-European. Historical relations beyond that age are highly controversial, as the traditional investigative method, by reconstructing series of small changes in sound-meaning correlations of words (system 19), becomes less reliable with time. But difficulties in demonstrating lines of historical descent from language to language do not invalidate the explanatory principle itself. There is no *a priori* reason for choosing an historical explanation for commonalities within language families but biological hypotheses for commonalities between them. Following Haraway (1989) such an explanatory schism may be associated with the historical struggle against racialism in the human sciences. The phonetic reconstruction method was used in the nineteenth century for tracing the Indo-European language family, and the cut off date of 5–8 kya happens to coincide with the age of this family, conveniently legislating against genetic relations with other languages spoken in the European empires. Biological explanations of linguistic commonalities then emerged in a post-WWII climate that prohibited scientific racism and focused on evidence of human biological unity. More recent attempts to extend the historical explanation to relations between language families have met with strong resistance from within linguistics, on methodological grounds (Ruhlen 1994), but these critiques do not negate the possibility of common historical descent.

Nevertheless, if contemporary languages are indeed descended from a common historical source, how could recognizable commonalities, such as those illustrated above, possibly persist over such a long time, and what could be the origins of this shared complexity? I would like to suggest that such explanations would need to meet four general conditions, that arise from the model of language in social context described here and the functional descriptions of languages accumulated to date.

The first condition would be a mechanism for precisely reproducing language patterns over extended time, that is over hundreds of generations at least, while allowing for adaptive variations within a limited range. Such a mechanism is actually implicitly assumed in traditional historical linguistics, that must be capable of reproducing recognizable sound–word correlations within language families over at least 200 generations, with gradual changes in forms of articulation that differentiate dialects and eventually differentiate languages. One implication of this assumption is that, while the capacity for language certainly involves a suite of biological adaptations in the human lineage, language itself appears to be a cultural adaptation reproduced intergenerationally by cultural means.

The second condition would be the emergence of articulated wordings as a mode of expression in social exchanges. Exchange behaviour is well described for primates (Benson *et al.* 2002; Goodall 1986; Whiten *et al.* 1999) as it also is for human infants (Halliday 1975; Painter 1984; Trevarthen 1987). Both primates and human infants use vocalizations and facial and bodily gestures to demand things or actions of others, and to evaluate each other's behaviour and other phenomena. Following the Darwinian principle of descent with modification, certain ecosocial conditions must have exerted selection pressures for expanding this capacity, so that a small set of vocalizations became systematized as a larger set of articulated wordings (i.e. as syllables). In other words, this more flexible mode of expression expanded the general function of semiotic behaviour in ancestral hominin populations for enacting exchanges, enabling a more complex set of meanings to be exchanged, without requiring an inexplicable evolutionary leap. This type of evolutionary development is a well-attested strategy for expanding the repertoire of meanings in languages, by differentiating existing general categories into more delicate distinctions (Halliday 1993a, 101). In this case, precise articulation of syllables enables the expression of innumerable fine distinctions in meaning.

While wording is likely to have first emerged in the context of interpersonal exchanges, a third condition would then require the functions of wording to



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be extended to construing speakers' experience of activities, people, things, places and qualities. Such an extension of linguistic resources, from an existing to a novel context, is a second common strategy for expanding the meaning repertoire of languages (Halliday 1993a, 101). The concept that experience recalled from one situation can later be represented symbolically to others who did not share that experience is a significant innovation that takes human infants a long time to recognize, involving several developmental steps (Painter 1984; 2004). It would likewise have taken several evolutionary steps to emerge from initial interpersonal functions of wording. One particular representation of experience, central to the grammar of all languages, is of a process involving people and things in places and times. This is the essential experiential pattern of the clause in all contemporary languages (system 10), realized as configurations of verbs, nouns and associated word classes, the 'universal syntax' of formalist theories. In the model applied here, however, the clause is presumed to have evolved as a strategy for exchanging experiences, emerging stepwise from earlier functions, rather than springing as a set of formal rules from chance genetic mutations.

Crucially, as shown in the discussion above, the clause is not the end of the story, but part of a much larger ensemble of resources for constructing discourse in contemporary languages. In this respect the model here diverges from theories of language evolution that do not go beyond the clause. The fourth condition, then, is the emergence of a set of devices for phasing together interpersonal and ideational meanings in discourse, enabling speakers to delicately negotiate complex social relations and to represent complex sequences of experience as stories (i.e. all the systems in Table 1). A key strategy here for expanding meanings is recombination; that is dissociation of language elements such as a wording and its meaning, and their recombination with alternative elements, producing novel meanings (Halliday 1993a, 101). Metaphor is an example of this strategy, in which a wording comes to stand for a new meaning.

In sum, the broad outlines of these suggested explanatory principles are that the elaborate discourse patterns of modern languages must have evolved in a series of steps, in which each innovation provided the conditions for the emergence of the next development. In each case the most likely evolutionary route from one step to the next is presumed to be the simplest. In terms of the language model in Table 1, the directions of development in language functions are from left to right — from the interpersonal negotiation of social relations, to the ideational construal of experience, to the textual organization of discourse. At the same time they evolve from the bottom up — in the mode of expression from primate vocalizations to articulated wordings, in the emergence of the clause as a pivotal resource, and finally in the proliferation of devices for constructing discourse. Three types of strategies for expanding meanings are involved — extension from one context to another, differentiation of a general category into more delicate categories, and novel recombination of elements. Each of these communicative adaptations must be reproduced across multiple generations and gradually accumulated in increasingly complex language systems.

All of these semogenic (meaning–making) processes are observable today in the phylogenesis of languages and/or in the ontogenesis of children's language acquisition. Studies of historical language change and child language development (Halliday 1993a,b; Painter 2004) have shown that advances typically begin with developments in interpersonal domains, and this is also argued for in socially oriented models of language evolution (Dunbar 1998; Knight *et al*. 2000; Tomasello 2000). Novel resources may then be extended from the interpersonal to ideational and textual functions. The sequence of acquisition documented in ontogenesis also offers a useful framework for interpreting the sequence of steps in language evolution (Matthiessen 2004): from a protolanguage expressed with vocalizations and facial and bodily gestures, to a transitional language system using articulated words, to the emergence of a simple clause grammar, and finally to the mature repertoire of social discourse. The discussion that follows explores these conditions in more detail, and suggests some possible steps that language evolution may have taken in meeting them.

## Cultural learning and the genus *Homo*

Language is reproduced across generations through processes that will be referred to here as cultural learning. While the neurological potential for language learning may be genetically inherited, systematic studies of parent–child interaction show that its specific patterns of meaning and expression are consciously and deliberately transmitted from carers to children (Bruner 1996; Halliday 1975; Painter 1984; 1999; Rose 2004a; Torr 1997; Trevarthen 1987; Vygotsky 1978; Wells 1999). These authors consistently contradict the assumption that children acquire language through independent observation or passive absorption. Rather, adults continually model language for them. Intensive



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continual modelling from birth eventually results in children learning how to recognize and use mother tongue language patterns for themselves. Secondly, these studies demonstrate that language emerges in the context of interpersonal interactions, that children's first communicative signs and later their first words are concerned with exchanging emotion, rather than representing experience, and that each subsequent development begins with innovation in interpersonal meaning before it is extended to the ideational domain. This finding challenges the assumption of formalist models that language begins as a 'system of representation' (Bickerton 1990) rather than as a mode of interpersonal interaction (Painter 2004).

Whiten *et al*. (1999, 382) define cultural behaviour broadly as 'one that is transmitted repeatedly through social or observational learning to become a population-level characteristic', and cite a large set of cultural behaviours in chimpanzees. Tomasello (2000) argues that such cultural learning typically occurs in non-human species through learners repeatedly observing behaviours and their outcomes, and eventually coming to emulate them. Nevertheless some animals such as cetaceans have also been observed to explicitly direct learners' attention to the behaviours they are to acquire (Rendell & Whitehead 2001). In humans this strategy is particularly highly developed, with the capacity for engaging in 'joint attention' emerging in human infants at around nine months. 'At this point, the caregiver and the child routinely focus together on the external world, exchanging attention *about* something else for the first time' (Painter 2004, 139; cf. Tomasello 2000).[5] This is also the age at which the child begins to develop a protolanguage of vocalizations and gestures (Halliday 1975; Painter 1984; Torr 1997). Before this age infants continually engage in exchanges with caregivers, using eye contact, facial expressions, vocalizations and imitating actions, and they also attend to and manipulate things in the external world, but they cannot do both at the same time. From nine months on, children build their protolanguage into a system comprising some scores of signs expressed by vocalizations and facial and bodily gestures, until it is eventually outstripped by their communicative needs and they begin to incorporate mother tongue wordings. Crucially their caregivers have been talking to them continually, initiating and responding with wordings to the child's signs for one to two years before children start using words themselves.

These processes of adult modelling, in micro-interactions and over extended time, until the child can successfully perform, have been termed 'scaffolding' (Bruner 1996; Rose 2004a; Vygotsky 1978; Wells 1999). They appear to be a fundamental feature of cultural learning in humans and are pervasive in all manner of pedagogic contexts. It is perhaps this pedagogic mechanism more than any other that enables human cultures to reproduce complex practices across multiple generations, and to accumulate cultural adaptations over time. In a cross-cultural study of scaffolded learning, Greenfield *et al*. (2000, 354) interpret its functions at three levels: 'What is called cultural transmission from the point of view of society, is called socialization from the point of view of the family, and development from the point of view of the individual.' From birth, children's behaviours are continually modelled, directed and evaluated as they become members of their cultures. And beyond these interactions, behaviours continue to be modelled and evaluated through verbal exchanges and narrative as illustrated in (1) and (2). Underlying all such intensive continual socialization are principles of social organization that enable human groups to flourish and reproduce, and these principles are reproduced generation after generation through scaffolding social behaviours. Examples include the egalitarian ideologies characteristic of hunting-gathering societies, that Whallon (1989) suggests may have been reproduced continually since the Upper Palaeolithic, as well as hierarchical ideologies that are often associated with agriculture and urbanization and are similarly reproduced by socialization in stratified societies (Bernstein 1996).

As well as language and social organization, a third set of human cultural behaviours reproduced by scaffolded learning are economic practices, particularly tool making and tool use. Tool-making behaviour is intimately associated with the genus *Homo*, as both emerged together with the Lower Palaeolithic era some 2.5 mya. As with language and social behaviours, economic skills such as tool making are learnt in all human cultures through scaffolding interactions involving modelling, direction and guided practice (Gamble 2004; Greenfield *et al*. 2000). Vygotsky (1978) explicitly classifies language as a set of symbolic tools, whose use is acquired through comparable learning processes as the use of material tools. Indeed tool making may have originated together with these scaffolded learning processes, evolving out of the more haphazard observation and emulation that Tomasello (2000) describes as characteristic of other primates. Scaffolded learning overcomes the uncertainties of independent observation and emulation, potentially ensuring exact replication of behaviours with high adaptive value, so enabling them to be accumulated over generations.

Archaeological models of cultural phases in human evolution indicate just how persistently tool-



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making behaviours can be replicated over extended time. For example, the simple stone-working techniques of Mode 1 tools were reproduced without significant innovation for a million years, until the more elaborate Mode 2 technology appeared around 1.5 mya. Mode 2 tools such as the ubiquitous bifacial 'hand axes' required their makers to work in steps to a complex conceptual plan, yet they were manufactured with relatively little variation for a further 1.2 million years. Hypotheses abound for how this was possible, including speculation of genetic imprinting, but this is unnecessary if cultural learning is capable of precise replication of successful cultural adaptations (cf. Kohn & Mithen 1999). The latter emerge within and must therefore be consistent with the principles of biological evolution (Cléirigh forthcoming; Depew & Weber 1996). Biological adaptations with a high adaptive value are reproduced through successive ecological shifts, so that modern humans for example are a composite of high value adaptations, from eukaryotic cells, through vertebrate musculoskeletal systems, to primate sociality. A set of genetic mechanisms ensure replication fidelity of such biological adaptations, over millions of generations (Kunkel & Bebenek 2000). Likewise certain mechanisms of cultural learning appear to have evolved in our genus to ensure replication fidelity and accumulation of high value cultural adaptations. Although its adaptive value must have been high indeed, the 'hand axe' tradition was eventually superseded by Mode 3 technologies, including relatively fine worked and hafted stone tools, with the transition to the Middle Palaeolithic. And again this technology was reproduced with relatively little variation for 300 millennia, across major ecological shifts, and at least three human species or sub-species, until it was superseded by the far more elaborate and diverse Mode 4 technologies associated with the Upper Palaeolithic some 50 kya. Many of the latter are found both in the archaeological record and in widely attested contemporary practices. For example Soffer *et al.* (2000) describe fibre technologies unearthed in Upper Palaeolithic eastern Europe, and produced identically in the same regions up to the last century.

From the perspective of modern industrial societies, adaptive innovation and diversity appear to be outstanding characteristics of human culture. But this viewpoint can obscure the underlying property of cultures as metastable systems, that maintain their organization by permitting peripheral adaptive variations (Lemke 1993). As Boesch (1996) phrases this, 'the key to culture … is a permanence-guaranteeing mechanism', and in human culture such a mechanism may be scaffolded learning. From the archaeological evidence of persistence of specific suites of cultural behaviours over deep time, it appears that scaffolded learning may be among the original cultural adaptations of our genus, evolving in tandem with the social, economic and communicative behaviours that it functions to reproduce and accumulate across generations. This may provide a sufficient and economical explanatory framework for the apparent persistence of linguistic patterning across languages, that warrants further investigation.

**Articulation: exchanging words**

Articulated wording is likely to have evolved in a series of steps from the vocalizations and facial and bodily gestures characteristic of primate communication. In this respect it has been widely suggested that protolanguages evolved during the Lower Palaeolithic, expanding the primate communicative repertoire, without necessarily requiring words (Armstrong *et al.* 1995; Hewes 1992; Kelly *et al.* 2002; Provine 1996; Owren & Rendall 2001; Rizzolatti & Arbib 1998; Schmidt & Cohn 2001). From a metafunctional perspective this is entirely possible: vocalizations and facial expressions are used by both primates and humans for interpersonal functions, such as demands or expressions of feelings, while bodily gestures can indicate things, places and directions in the context. For example, a thing can be indicated by pointing or touching, and demanded by an insistent tone of voice, interpretable as commands: 'give <u>that</u>', 'look <u>here</u>'. Or a thing can be indicated by pointing or touching, and evaluated by a vocalization and/or facial expression, interpretable as statements: '<u>this</u> is good/bad/interesting/frightening'. These are not yet ideational meanings, as things and places are indicated rather than construed by words; but they are textual in the sense that they present meanings in relation to their context. Benson *et al.* (2002) demonstrate that these indicating and interpersonal meanings are recognized and produced by primates, and so were certainly available to early *Homo*. Combined with the potential for joint attention, these modes of expression would enable pedagogic exchanges in which a teacher directs attention to things and places, such as the spot to strike a stone to accurately flake it, or the direction to follow an animal track or to dig out a burrow, and affectively evaluates learners' efforts in practising these activities. Experiments with captive primates have demonstrated that scaffolded learning can enable them to acquire human cultural behaviours, including some language (Benson *et al.* 2002), suggesting that early *Homo*, with a growing neural capacity, would have had the potential to use



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protolinguistic communication to scaffold learning. Furthermore, the developmental co-emergence of joint attention and infant protolanguage seems to indicate an evolved biological capacity for scaffolded learning that can be mediated by a protolanguage.

It is essential to note, however, that protolinguistic communication that has been suggested for the Lower Palaeolithic cannot be equivalent to modern infant protolanguages, although they may share some features. Ancestral protolanguages served the needs of adults transmitting cultural behaviours to the young, and interacting with other group members, whereas contemporary infants use theirs to communicate their needs to adults who respond in language. On the other hand, the term protolanguage is used here (and by other authors) in the sense of a precursor to the evolutionary emergence of language, as Halliday uses it for the developmental precursor to adult language.

The evolution of articulated words from earlier vocalizations undoubtedly involved several interrelated factors. Two that stand out are the potential for expressing finer distinctions in meaning, and increased stability of such a system. While protolanguages of different individual infants appear to fulfill similar general functions to express feelings, demands and comments, their vocal and gestural modes of expression are idiosyncratic, created by the child and often understood only by their close caregivers. After expanding up to a few score signs, they become too limited for the child's communicative needs and the transition to mother tongue language systems begins. Similarly expansion of meaning potential would have been one factor selecting for the evolutionary emergence of words from ancestral protolanguages, perhaps together with standardization of expression between group members, enabling both meanings and expressions to be accumulated over generations.

The fundamental unit of articulation in all languages is the syllable. A syllable is produced by coordination of lip and tongue postures with a movement of air over the vocal folds, and the resulting sequence of sounds is correlated with a conceptual category we know as a word (Cléirigh 1998). The core of the syllable is a vowel, produced by opening the mouth, and modified by altering the shape of tongue and lips. It is typically preceded by closing the vocal tract in some way, producing consonants, and may also be followed by a closure. Alternative ways of closing with lips and tongue position produce a vast potential for varying syllable structures. Out of this relatively simple device flow the millions of distinct words in the world's 6000 plus languages. Physiological adaptations to the vocal tract that enable syllable production include delicate control over the vocal folds that modulate voicing and complex musculature of the tongue that modulates vowel and consonant formation. Associated neurological adaptations are at two levels: firstly in neuromuscular control to produce fine sound distinctions and auditory perception of such distinctions, and secondly in the correlation of syllable variants with conceptual categories.

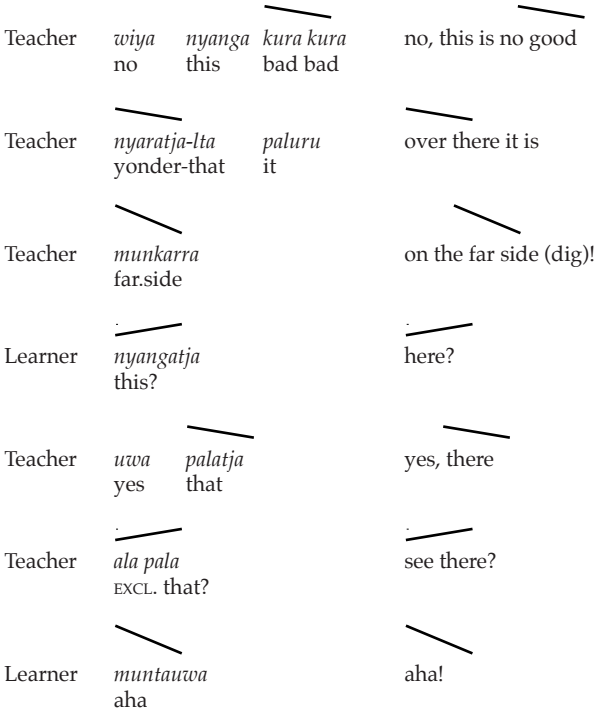
As a mode of expression, MacNeilage & Davis (2000, 530) offer a cogent model for how syllable systems could emerge from primate vocalizations. They propose a set of 'protosyllables' that could derive from 'ancestral hominids borrowing simple available biomechanical properties of the system … by means of classic Darwinian descent with modification'. These include 'visuo-facial communicative gestures' such as lip-smacks, and 'ingestive processes' such as chewing, sucking and licking. They have identified four protosyllables that are preferentially produced by human infants across cultures, from the physiology of the jaw, lips and tongue, initially /*ma*/ /*da*/ /*ga*/, and later /*pat*/. These patterns were also statistically favoured in a survey of diverse languages, and in a list of 'global etymologies' proposed in Ruhlen (1994).

With respect to meanings, an indefinite set of possible syllables can be correlated relatively freely with an indefinite set of conceptual categories. The large neuronal capacity of modern humans is probably associated with the immense complexity of these multi-layered correlations (Edelman & Tononi 2000). Formalist evolutionary models such as Bickerton (1990) postulate that the meaning of first words to be articulated must have represented 'concrete objects'. But as suggested above, the concept of construing experience through language constitutes a major developmental and evolutionary leap. It is essential to identify plausible intermediate steps in this evolutionary trajectory, and this is made possible by the SFL theory of language as meaning in context. In fact it is common for speakers to refer to people, things and places in the situation of speaking, without requiring any ideational words at all. This is illustrated by the following exchange (3), in which a teacher is guiding a learner to dig out an underground nest of honey-ants, an important desert food source (for extended text see Rose 2001a&b). In this learning exchange, the teacher directs the learner without naming any of the things or places he is digging. The Pitjantjatjara original is given on the left, and the English translation on the right, to show the parallels in wording and tones.

| (3) | **Pitjantjatjara** | **English** |
|---|---|---|
| Learner | *nyangatja*<br>this? | here? |



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Rather than naming things and places in the situation, they are indicated here with demonstrative pronouns, *nyanga* 'this', *pala* 'that', *nyara* 'yon' or spatial adverbs such as *munkarra* 'far side'. This is a typical pattern in context dependent discourse across languages; it contrasts with genres such as stories that construct their own context by naming things and people, and use pronouns to track them through the discourse, as in (2). This contextual distinction is not significant in formalist models that rely on written or invented sentences for data, and so view words like pronouns as 'structure words' that are merely ancillary to 'content words' that represent objects in the world. In addition to the role of pronouns, each move in exchange (3) is indicated by its tone: *rising* for questions, *low fall* for statements and *high fall* for commands or exclamations. Again the critical role of these tones for distinguishing exchange moves is not included in formalist models, as they are not recognized as part of sentence syntax.

In this kind of exchange there is no need to name people, things or the activity because that is what is going on in the context. This context is shared in the here-and-now by the speakers, so that both understand explicitly what is being indicated, demanded or questioned. Together with a few other words for affirming or negating *yes/no*, and evaluating *good/bad*, these relatively simple resources enable a teacher to apprentice learners into cultural behaviours within the situations in which they are practised. They enable speakers to demonstrate and direct activities and ask for direction, and to evaluate things and activities. Such combinations of demonstration, direction and comment remain the primary pedagogic mode for domestic and craft activities in all cultures, and are learnt primarily through scaffolding in context, as in this exchange (Gamble 2004).

This kind of context-dependent instructional discourse may be a sufficient social function, as well as an economical explanation, for the emergence of articulated wordings. We have seen how its syllabic mode of expression may have evolved from vocalizations; the next question is how its semantic functions may have evolved. As always, the most plausible starting point is with interpersonal functions in exchanges. Following MacNeilage & Davis's (2000) suggestion above, articulated words may have initially derived from infant calls such as *ma*, *da*, *pa* that were consistently correlated with close kin relations, and so acquired stable functions as terms of address, i.e. vocatives. This is certainly the function reported by Halliday (1993a, 19; 2004, 30), for one child's first words addressing caregivers as *ama*, *dada* and *ana*. The semantic shift from infant calls for attention to vocative terms of address simply extends an existing resource from one interpersonal function to another. The innovation of wording could then extend to evaluative words for appraising activities. Contemporary analogies are one syllable exclamatives like *yum!* and *yuck!* that, like protolinguistic vocalizations, are often associated with facial gestures. As in these examples, the first words required no more than a single syllable involving a simple articulatory cycle of consonant-vowel-(consonant), or at most reduplicated syllables such as *mama*.

As well as vocatives and appraisals, all contemporary languages have words for indicating people, things and places in the context of speaking. Personal pronouns such as *you* and *I* indicate speaker, addressee and others, while demonstrative pronouns such as *this* and *that*, or *here* and *there* indicate proximity to speaker and addressee. Across languages there is consistent evidence of deictic (pointing) functions of demonstratives evolving from the interpersonal functions of personal pronouns, early in language evolution. Halliday (1994, 312–13) elaborates:

> … we may postulate an imaginary stage in the evolution of language when the basic referential category of PERSON was DEICTIC in the strict sense, 'to be interpreted by reference to the situation here and now'. Thus *I* was 'the one speaking'; *you* 'the one(s) spoken to'; *he, she, they, it* were the third party, 'the other(s) in the situation' … in origin [demonstratives] were probably the same as third-person forms, but they retain a stronger deictic flavour than the personals.



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From the interpersonal nucleus of *you* and *I,* a further small step is to indicate another person in the situation *it* (a basic 'third-person' pronoun), and then to indicate things and places, initially with the same third-person form, but then distinguishing proximity as *this*/*that*/*yon*. Halliday (1994, 313–14) continues:

> Proximity is typically from the point of view of the speaker, so *this* means 'near me'. In some languages … there is a close correspondence of demonstratives and personals, such that there are three demonstratives rather than two, and the direction of reference is near me (*this*), near you (*that*) and not near either of us (*yon*). This pattern was once widespread in English …

This three-way correspondence between person and proximity is also common in Australian languages, among many others.[6] In addition to such deictic words, a teacher must be able to command a learner to act, and to give information about what to act on, and a learner must be able to ask a teacher for such information. The most common strategy across languages for making such distinctions is the melodic contours on which syllables are voiced, i.e. tone contrasts, as Halliday (1994, 302) explains:

> The falling/rising [tone] opposition is the most fundamental one there is, and it probably plays a part in the system of every language, though with great variation among different languages in its scope and value in the system. In English … falling pitch means 'polarity known', while rising pitch means 'polarity unknown'.

This semantic opposition seems to be both widespread and ancient. Benson *et al*. (2002) suggest that primates recognize a distinction between falling and rising tones, and vocalize it to distinguish affirmations from other functions. It has also been suggested that tone distinctions were a critical feature of human protolanguage, from which tone prosodies of both singing and speaking may have evolved (Morley 2002). Certain east Asian and west African languages use tone contrasts differently, to distinguish ideational word meanings, although these languages also often use tones for interpersonal functions, in common with most languages (Hirst & di Cristo 1998). With some exceptions the tone systems of English and Pitjantjatjara are surprisingly similar, functioning to distinguish exchange moves, as well as many more delicate distinctions in the force of commands and statements (Rose 2001a&b; 2005a; in press).

As suggested above for evolutionary protolanguages, the complementary resources of words and tones allows two kinds of meanings to be exchanged simultaneously — pronouns indicating people, things and places, and tones differentiating moves in the exchange. This strategy is also well-attested in early child language learning, described by Painter (2004, 140):

> From the available case studies, one typical strategy for achieving dual strands of meaning is for the child to use an articulatory meaning (e.g. [dada] as the name *Daddy*) and a prosodic realization for the interpersonal meaning (e.g. rising/level tone or tense voice quality…).

With respect to the archaeological evidence, it has been widely suggested that articulated wording began with the Middle Palaeolithic transition, sometime before 300 kya. Bickerton and others have postulated the additional origin of 'syntax' at this point, or rules for ordering words in sentences, but we have shown that this additional complexity is not necessary in this step. Evidence for the beginning of wording with Middle Palaeolithic peoples includes a cranial volume comparable with modern humans, and the possible presence of a hyoid bone that functions in modern humans to support the vocal apparatus, as well as the innovation of the more complex Mode 3 technology and foraging strategies and living patterns. These proposals are supported by the discussion above. Firstly, increased neural capacity is consistent with the immense complexity of correlating syllable articulation with conceptual categories, in production and reception of wordings. Secondly, increased complexity of technologies and foraging strategies is likely to require resources for cultural learning that are both more specific and more stable. As we have seen in exchange (3) wording can provide these advantages, to specify persons, direction, proximity, and evaluations. And it also advances on gestural modes of expression, as it enables teacher and learner to direct, question and comment on activities at the same time as they are performing the activities.

**Ideation: construing experience**

The construal of experience at the heart of ideational meaning in all contemporary languages is of a process involving people, things, places and qualities. Halliday (1994, 108) expands:

> In this interpretation of what is going on, there is doing, a doer, and a location where the doing takes place. This tripartite interpretation … is what lies behind the grammatical distinction of word classes into verbs, nouns and the rest, a pattern that in some form or other is probably universal among human languages.

These are the universal elements of clause structure that are the focus of syntactic models of language evolution. But Halliday's proposal is that they originate from construing experience in language, rather than



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**Figure 5.** *Nuclear model of experience as activity.*

from non-meaningful rules, and that this construal of experience is embodied in the grammar of the clause:

> The clause … embodies a general principle for modelling experience — namely the principle that reality is made up of PROCESSES. Our most powerful impressions of experience is that it consists of goings on — happening, doing, sensing, meaning, being and becoming. All these goings-on are sorted out in the grammar of the clause (1994, 106).

From this perspective, the core elements of such a figure are the process and the people and things involved in it, while places and qualities are optional and so more peripheral (Halliday 2004, 161–73; Martin 1992; 1996; Rose 2004b). This nuclear model of experience is diagrammed in Figure 5. The 'doer-doing' nucleus is represented as a revolving yin/yang complementarity, with 'place' and 'quality' in peripheral orbits.

Examples of such figures are shown in exchange (4), between a younger brother (YB) and an elder brother (EB), who have been travelling and are camping for the night (from Rose 2001a).

(4)

| | | | | |
|---|---|---|---|---|
| YB | *kuta* | *ngayulu* | *nyangangka* | *ngari* |
| | elder brother, | I | here | lie |

Big brother, may I lie here?

| | | | | |
|---|---|---|---|---|
| EB | *wiya* | *nyaratja* | *tjitji* | *ma-ngari* |
| | no | yonder | child | apart-lie |

No, over there child, lie apart, will you!

In both figures the process is *ngari* 'lie', and the person who will be lying is the younger brother. The negotiation here is about the place he will lie in *nyangangka* 'here' or *nyaratja* 'yonder'. Different languages prefer various ways of arranging the process, people, things and places in a clause, but in any passage of natural discourse in any language, the order of elements changes from clause to clause, for textual reasons. YB could have said, for example, *I lie here, here I lie,* or even *here lie I*. In most cases the experiential meaning is not changed by varying the order. In such simple figures, 'syntax' is still irrelevant, as the meaning is realized not by grammatical rules but by semantic relations between the elements 'person', 'place' and 'process'.

As suggested above for the origin of wordings, one context in which the potential for construing activities as clauses could evolve is in pedagogic interactions. In activities such as exchange (3) the process in each step does not require naming as it is always the same, 'dig'. In (4) the process is named *ngari* 'lie', but people and places are still referred to only with personal and demonstrative pronouns. Similarly, teaching an activity sequence that involves more than one possible action need not require naming things and people, but it does require types of actions to be distinguished. To this end, it may be a relatively small semantic step from the directional contrast in demonstratives, between *here* and *there*, to simple lexical contrasts such as *come/go*, *put/take*, *hit/stop*. This is a common phenomenon across languages, for the same word stem to function as a thing, quality, place or process, so a functional extension from demonstrative pronoun to directional process could be one plausible origin for verbs.

In what environment might such a pattern evolve if, as demonstrated in exchange (3), pedagogic exchanges are possible without taking this additional step? Again the answer may lie in the social realm, but this time perhaps beyond pedagogic exchanges, in wider exchange relations between social groups. In this respect archaeological evidence may indicate a plausible context, in the appearance of anatomically modern humans around 130 kya. Although these ancestors appear to have been anatomically identical to us, their technology remained a simple Mode 3 toolkit. But one possible cultural development over archaic humans is suggested by raw material transfers up to 300 km, indicating exchanges between neighbouring groups (Ambrose 2001; Gamble 1998). Marwick (2003) suggests that the stone was not exchanged for material need, as similar stone resources existed in the receiving regions, but are more likely to have been exchanged from group to group as goods within a reciprocal exchange network. This seems to represent a major shift in social organization, from non-cooperating separate groups characteristic of primates, and probably of earlier humans (Boehm 2000; Goodall 1986; Mellars & Stringer 1989), to inter-group exchanges.

Two sets of linguistic resources that would enable such inter-group relationships are interpersonal resources for enacting more complex social relations, and ideational wordings for construing activities, people, things and places beyond the speaking situation.

Firstly, wider social relations require more than the simple resources for negotiation shown in



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exchange (3). Exchange (4) illustrates two further interpersonal developments. One is kinship terms that are used for enacting status and solidarity, and the other is more delicate uses of tone to adjust the force of locutions. In (4) the younger brother begins with the respectful vocative *kuta* 'elder brother', spoken on a low falling tone, followed with a demand on a rising tone. As the default tone for both vocatives and demands is a high fall, these variations literally enact a 'deferential tone'. The elder brother responds with a flat *no*, followed by a direct command *lie apart over there!*, including the dominating vocative *tjitji* 'child'. The force of the command is stressed with a high falling tone, followed by a high fall-rise. These vocative and tonal resources differentiate simpler interpersonal categories into more delicate distinctions. Again they are common to Pitjantjatjara and English, with some differences. (For descriptions of the functions of tones in English and Pitjantjatjara see Halliday 1967; 1994 and Rose 2001a; 2004c; 2005a; in press).

Secondly, social relations beyond the immediate kin group may have provided selection pressure for the emergence of the clause and its elements, as stable linguistic units for representing non-shared experience. While the clause could have first evolved in context-dependent pedagogic interactions like (3), representing non-shared experience also requires people, things and places to be specified with nouns, instead of just indicated with pronouns. This could emerge from two directions — naming and classifying.

In the context of groups sharing resources across a large territory, naming would be selected for specifying both people and locations. On the interpersonal first principle, the likely starting point is with names for people, which could then extend to names for places. This evolutionary pathway is strongly suggested by the close parallels between person names and place names in contemporary languages: both are specific to unique entities and as 'proper nouns' they share the same functional paradigms. And in many cultures, people are often named for the places they belong to (including English and Pitjantjatjara).

Likewise, classifying the world would also begin with classifying people, as types of kin. As suggested above, kinship terms are likely to evolve initially as terms of address for immediate family members. As relations expand beyond the immediate family group, kin terms provide a stable framework for addressing more distant kin, avoiding inter-group conflict by expressing appropriate degrees of deference and solidarity. But in addition to terms of address, kin terms can also be used to refer to other people outside the speaking context, as one or another class of kin. Kin terms classify the world of people in a kinship system, based on the criteria of generation and gender in the categories *mother/father; brother/sister; son/daughter*. The semantic innovation of classifying the social world then provides a conceptual basis for classification of the natural world. As the principle of naming is extended from the social realm (persons) to the natural realm (places), the principle of classification may be extended from social classes (kin) to natural classes, such as material resources and tools, using 'common nouns' to refer to such things independently of the speaking context.

These interpersonal and ideational patterns are intermediate between the simple resources for enacting context dependent exchanges illustrated in exchange (3) and the elaborate resources for negotiation and narrative shown in (1) and (2). Three factors suggest that these intermediate systems may have evolved with anatomically modern humans, rather than before or after. The first is the material evidence of inter-group exchanges discussed above, and argued cogently by Marwick (2003) as a likely context for the emergence of clause grammar. Secondly, the stability of Mode 3 technologies and foraging and living patterns over some 300 millennia imply that simple context dependent exchange resources such as in (3) may have been sufficient for reproducing these simple cultural patterns in archaic Middle Palaeolithic populations. On the other hand, it is unlikely that the elaborate discourse patterns of modern languages evolved with the first anatomically modern humans, as there is no evidence of the elaborate social and material cultures with which they are now associated. Rather these represent a further evolutionary step for which the intermediate language resources provided the necessary conditions.

One further development at this stage needs noting, that of rhythm (system 18). Each move in (4) consists of not one or two syllables, but a series of varying syllables spoken in rapid succession. Waves of syllables in the elder brother's move are diagrammed in Figure 6. The peak of each wave is the syllable that is stressed in each word. Rhythm can function to demarcate words and groups of words in the flow of speech, although there is much variation between languages in this respect (Cléirigh 1998; Halliday 2004). This rapidly recursive stressed-unstressed rhythm is produced by cycles of air pressure controlled by the diaphragm,

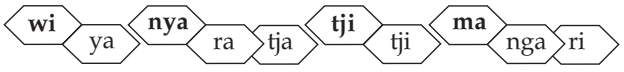



**Figure 6.** *Syllable waves (after Cléirigh 1998).*



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together with rapid movements of the lips, tongue and vocal folds as each syllable is articulated (Cléirigh 1998; MacLarnon & Hewitt 1999; MacNeilage & Davis 2000). Along with the semantic resources discussed above, it is also possible that the physiological adaptations for producing and perceiving rapid rhythmic speech are associated with the evolution of modern human anatomy.

**Discourse semantics: a symbolic revolution**

Some parameters have been mapped out that could be used in developing functional models of language evolution, and correlations with archaeological evidence have been suggested, that offer possible timings for evolutionary steps. To this point the discussion has been broadly consistent with other models in the sequence of developments, from protolanguages, to articulated wordings, to the emergence of clause grammar, but as we showed at the start, the clause is not the end of the story, but merely one step on the way to the elaborate discourse patterns of modern languages. If we ignore this last phase of language evolution, we are left with no more than words within clauses as an explanatory framework, which cannot adequately account for relations between contemporary languages and cultures and how they came into being. Models that do not build discourse systems into their accounts remain unstratified, misconstruing modern adult languages as if they are organized like infant transitional languages, consisting of just two levels, of wordings and their expression as sounds.

Before the emergence of modern discourse systems, language may indeed have consisted of just these two strata: wording and sounding. Together these would have been able to enact moves in simple exchanges, as we have illustrated in (3) and construe experience as simple figures, as illustrated in (4). But it is not possible, in such an unstratified language system, to delicately negotiate joint activities as in (1), nor to construe extended activity sequences independently of the speaking context as in (2). These social functions require meaning potential to expand beyond simple clauses in two directions:

- above the clause in discourse strategies for (a) managing negotiations, (b) sequencing activities, (c) keeping track of people and things, and (d) organizing information,
- within the clause in grammatical strategies for (a) distinguishing exchange moves, (b) specifying processes, people and things, (c) keeping track of identities, roles and time, and (d) organizing messages.

Some formalist models do propose that the structures of word groups evolved after the clause, as they constitute an additional layer of syntactic complexity, but in the functional model here, group structures within the clause emerge only in tandem with discourse functions beyond the clause. Four evolutionary steps, from ancestral protolanguages, to exchanges of articulated wording, to simple figures, to discourse systems, are schematized in Figure 7.

The next questions are why and how the complex discourse systems described here could have emerged from simple systems of words in clauses. To this end we need to look again beyond language, to social theory and archaeological evidence for possible selection pressures. As outlined for texts (1) and (2) above, the cultural contexts of discourse systems lie in complex societies, in which groups interact to negotiate exchanges of resources and reproduction of their social fabric. All modern peoples live in such societies, whether their modes of economic production are hunting-gathering, nomadic pastoralism, farming, or urban manufacturing. This was recognized by Durkheim (1912) from early ethnographic descriptions (Spencer & Gillen 1899) and informed the founding principles of the sociological field. It contradicts naively linear models of cultural evolution that imagine people living in isolated small groups before the development of agriculture, a misconception that is all too common in the field. What I would like to suggest in this final section is that such complex social organization is a necessary condition for the emergence of complex discourse, and conversely that the latter is a necessary resource for organizing social complexity. I have argued that such complexity is unlikely to have evolved independently in separate human populations, but that it derives from common historical sources. A model for investigating these sources is suggested by insights from palaeoclimatology.

According to deMenocal (1995), phases in human evolution appear to correlate with climatic cycles in the Pleistocene era, in which African ecosystems repeatedly aridified as a result of major northern hemisphere glaciations. Adaptations may have been selected for by deteriorating environmental conditions, to appear subsequently in the fossil record as populations increased in less arid interglacial periods. During these interglacials, ancestral human populations repeatedly expanded out of Africa into Eurasia. These relationships between climate and human evolution have been referred to as the 'variability selection hypothesis', which argues that adaptations to climate fluctuations 'enhanced behavioural versatility and ultimately ecological diversity in the human lineage' (Potts 1998, 93). DeMenocal identifies severe climatic



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episodes that precede the initial appearance of the *Homo* genus at 2.5 mya, and of the Mode 2 technology at 1.5 mya. Other major glaciations included 470–330 kya, that preceded the appearance of the Middle Palaeolithic culture, and 180–130 kya that preceded the appearance of anatomically modern humans.

During the subsequent interglacial, populations of anatomically modern humans expanded with the African savanna ecosystem into the Levant, but retreated when it aridified following the onset of the most recent glaciation after 80 kya. Their remains in the Levant are thus overlain by Neanderthals who expanded south from Europe with the boreal ecosystem to which they were adapted (Bar-Yosef 1998). Genetic evidence and the paucity of remains of the first anatomically modern humans indicate drastic population crashes with the severe onset of the last ice age, suggesting that their cultural adaptations did not yet give them the flexibility to adapt to rapidly changing environments (Ambrose 1998; Klein 2000; 2001). The next major cultural phase, the Upper Palaeolithic, did provide this adaptive flexibility. It becomes fully apparent in the archaeological record around 50 kya during an extended mild interstadial during the last ice age, following a series of chaotic climate fluctuations between 87 and 60 kya.

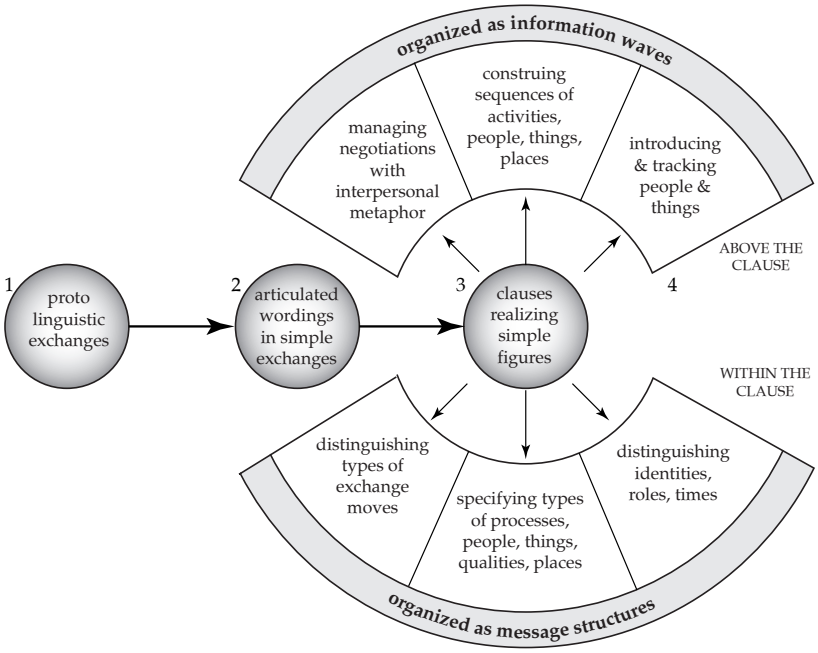



**Figure 7.** *Proliferation of meaning potential above and within clauses.*

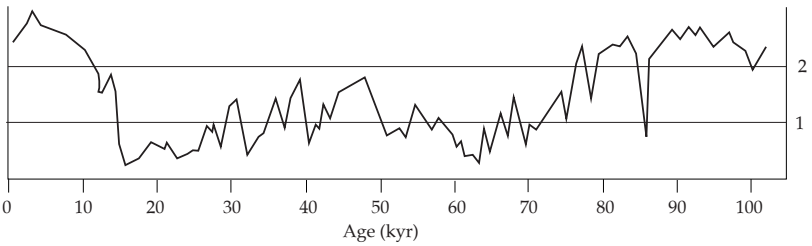



**Figure 8.** *Environmental changes during the Würm ice age (adapted from Allen* et al. *1999).*

These climate movements are clearly visible in Figure 8, showing changes in vegetation for the Mediterranean region, from temperate forests above line 2, to cold steppes below line 1. Changes from forest to steppe in this region frequently occurred in less than 200 years, corresponding in the African savanna to changes from grassland to devegetated desert, which would have put extreme adaptive pressures on human populations. Ambrose (1998) argues that such a climatic disaster explains the population bottleneck at 70 kya, in which the ancestral human population evidently crashed to a few thousand individuals.

It is possible that these catastrophic conditions selected for cultural adaptations that accumulated in surviving human groups to form the Upper Palaeolithic culture complex. It was certainly during the subsequent interstadial that their population expanded across the whole of Africa and Eurasia, by 40 kya reaching the Siberian Arctic (Fort *et al*. 2002) and Greater Australia (O'Connell & Allen 1998). Ke *et al.* (2001) report that all modern non-African populations share a common genetic origin at 43 kya, perhaps precisely dating the initial expansion from Africa. Rates of expansion calculated by Fort *et al*. are then consistent with the evidence of their arrival in Europe, Siberia and Australia.

Upper Palaeolithic culture is characterized by elaborate resource exploitation patterns and living arrangements, and sophisticated Mode 4 technologies, together with long-distance exchange networks and a host of symbolic activities (Bar-Yosef 2002). In terms of social relations these cultural adaptations may be related to the emergence of complex societies that are



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organized to maximize the potential for resource exploitation and exchange across large regions (Shennan 2001). As mentioned earlier, many features of Upper Palaeolithic culture are found both in the archaeological record and in contemporary practices. In addition to the fibre technologies described by Soffer *et al.* (2000) are universal techniques for processing plant fibres to make traps, nets, bags, clothes and shelters, consistent patterns of plying, knotting and weaving, the use of grindstones to extract starch and protein from grass seeds (Wright 1992), the spearthrower, used around the world to extend the projectile power of a hunting spear, together with plant resins and animal sinews used to bind and glue compound tools and weapons in wood, stone, bone and antler (Mulvaney & Kamminga 1999). With respect to social organization, Allen (1989) argues that the great diversity of contemporary kinship systems are descended from a single common type, which he describes as 'tetradic'. But in the view of pre-industrial peoples themselves, the key adaptation that ensures the survival and reproduction of their societies is not simply technological innovation but religion (Durkheim 1976; Frazer 1975), and religion is a major characteristic of Upper Palaeolithic culture (Mithen 1996; Whallon 1989). Evidence includes ritual objects and burials accompanied with red ochre in sites across Eurasia and Africa, and still used across the world as a religious sacrament; carvings and paintings on ritual objects and rock surfaces representing people and animals in economic and ritual activities; and paraphernalia such as masks and necklaces of shell, bone and teeth, found in graves and shown in rock art (Conkey *et al.* 1997; Kuhn *et al.* 2001).

The relevant implication of this evidence for models of language evolution is that such proliferation of cultural contexts presupposes the proliferation of elaborate linguistic resources for negotiating exchanges and construing experience. Even without a sophisticated model of discourse systems, a number of authors have recognized a likely association between the Upper Palaeolithic and advanced language capacities (Leary & Buttermore 2003; Marshack 1989; Whallon 1989). In light of the linguistic evidence illustrated in texts (1) and (2), this timing of the emergence of modern discourse systems has significant implications for the peopling of Australia, and hence for models of recent human evolution in general. A series of controversial datings have been widely publicized in the last decade or so in support of hypotheses that ancestral Australians arrived in the continent at least 60 kya, long before the Upper Palaeolithic becomes fully apparent in Africa and elsewhere, and that they may even have descended from Southeast Asian hominins, a view that is not generally accepted in Australian archaeology. A seminal reply is O'Connell & Allen (1998), who describe a large suite of established earliest Australian and southeast Asian sites clustering around 40 kya, and who cogently critique the earlier datings on grounds of doubtful methodological validity and the lack of any complementary evidence in the rest of Australia for the following 20,000 years, or of corroborating evidence from other regions. They conclude that,

> Defining the global expansion of modern humans as a single event, of which the occupation of Greater Australia is an important part, is the simplest interpretation of the large body of pertinent archaeological, palaeontological and genetic evidence now available (O'Connell & Allen 1998, 145).

Taken together with the archaeological evidence of Upper Palaeolithic cultural developments and demographic expansions, the evidence from SFL language descriptions, particularly of Australian languages illustrated here, lends strong support to this conclusion. That is, the simplest interpretation of this mounting evidence seems to be that all contemporary languages, including Australian ones, have evolved from a single cultural-linguistic complex, associated with the emergence and expansion of the Upper Palaeolithic.

## Conclusion

Mapping the processes and sequences of the evolution of language in its cultural contexts is an indefinitely large project that involves research across many disciplines, with implications that concern all the world's peoples. In such a project it is not possible for any one discipline, or any one paradigm within a discipline, to monopolize explanatory theories, nor to exclude evidence offered from other fields and theoretical frameworks. For these reasons the proposals and evidence presented here are proffered tentatively as potential signposts, that may help to inform further research. Nevertheless, as they arise from the extravagant SFL model of language in social context, in some respects they go beyond those presented in other current models. Avenues for expanding current research that could test or modify proposals in each section of the article are suggested in Table 2.

More generally, we need to develop models of culture and language that can systematically identify shared and innovative features, and so inform our yet meagre understanding of the networks, time-depths and processes of historical relations between the world's peoples. Such a project depends on building transdisciplinary understandings between the study



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**Table 2.** *Potential further research.*

| Proposals | Potential research |
|---|---|
| 1. Common origins for language systems outlined in Table 1. | Mapping shared and differing patterns of discourse across languages, in dialogic exchanges, stories and other genres. |
| 2. Cultural reproduction of language systems and other cultural behaviours over $10^3$ generations. | Analyses of potential for replication fidelity of scaffolding and other forms of cultural transmission, of social organization, economic practices and language. |
| 3. Expansion of interpersonal and deictic functions, from primate communication to pedagogic functions in hominin protolanguage. | Descriptions of communicative functions and their expressions that are shared or intermediate between primate communication and human infant protolanguage. |
| 4. Emergence of wording and intonation in pedagogic contexts, from primate modes of expression. | Studies of pedagogic interactions between children and carers across cultures, focusing on functions, expression and prevalence of context-dependent meanings. |
| 5. Extension of functions of wording to construing experience as activities in clauses. | Studies of sequences of language development, focusing on emergence of ideational functions from interpersonal innovations. |
| 6. Stratification of language into discourse and grammar enabling delicate negotiation and complex narrative. | Expansion of the traditional focus of linguistic study, beyond the clause to systems of discourse and their social functions across cultures. |

of social interactions in linguistics, and the study of social practices and their organization and history in archaeology and other human sciences. This was an original goal of M.A.K. Halliday in developing systemic functional theory (1978); the article here is offered in this spirit.

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## Notes

1. Rates of change vary between regions of language systems; higher level patterns appear broadly more persistent than lower ones, so that closely related languages may mean similarly, and be articulated quite differently.
2. The author is also a member of the Western Desert ceremonial Men's Law.
3. The *Piltati* story was told by Nganyintja, a senior woman in the Pitjantjatjara community.
4. An atypical starting point in Text (2) is the purpose in line 2, *for wallaby game*, that serves to mark a contrast against *kangaroo* in the preceding line.
5. Tomasello claims that joint attention and imitative role reversals are unique to humans, but Benson *et al.* (2002) demonstrate that primates are capable of both. Nevertheless they are clearly far more highly developed in humans. Tomasello is also at pains to distinguish learning by 'emulation' or 'imitation', claiming that the latter is characteristically human, but scaffolded learning is missing from his model, as it is from much discussion about the evolution of culture and language, overlooking a large body of research on learning in humans.
6. It has also been suggested that the deictic (pointing) functions of language and gesture are neurologically linked, as the same brain regions control musculature of both speech and gestures of the hands and face, as well as manual dexterity (Kelly *et al.* 2002; Lieberman 1998; Rizzolatti & Arbib 1998).

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