WHAT WERE WE TALKING ABOUT?
EXCHANGING SOCIAL MODELS AS A ROUTE TO LANGUAGE

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This paper looks at the role that social calculus and the exchange of social models could have played in the process leading to human language. It considers the nature and source of social calculus, its place in the evolution of humans, and its consequences for language. The paper is exploratory rather than evidential, but it does provide a plausible explanation for the appearance of grammatical form in human language.

Introduction

There has been considerable discussion on the "how" (e.g. Aitchison, 1996) and "why" (e.g. Dunbar, 2009) of language origins, and some discussion on the "who" (e.g. Johansson, 2013). The "where" of language origins is also now agreed: it is most likely to have happened in Africa, between the evolution of *Homo sapiens* and our diaspora across the globe (e.g. Tattersall, 2009). However, the "what" question remains largely unaddressed: what particular communicational activity required the suite of functions that typifies human language? It is not enough to view the versatility of grammatical language as the reason for its appearance, that is putting the effect before the cause. Instead, there must have been a particular cognitive function which could only be shared using a complex, language-like system; and, to become shareable, it must have involved information which was advantageous to both sender and receiver.

This paper considers the sharing of knowledge about social relationships as a primary linguistic event, and looks at the events that could have brought it about. Sharing social information is a communicative activity which seems to be exclusively human, a necessary feature of the reputation-driven (Engelmann *et al*., 2012), altruistically punishing (Boyd *et al*., 2003), reverse-dominant (Boehm, 1999) culture of modern humans. This paper relies, and builds upon, Dunbar's gossip hypothesis (Dunbar, 1996); but it looks at the cognitive and communicative structures that underlie gossip, rather than the grooming and socialisation functions that gossip provides.

A cognition of social relationships

A key feature of human socialisation is the ability to map relationships between others in our social group. Like many other animals, we are able to cognitively model other individuals and our relationships with them; and, like other primates, we can also model relationships between other individuals, and use those models to adjust our relationships with those other individuals.

At first glance, the modelling of relationships between other individuals (the two argument form of A-relationship-B) would seem to be a simple extension of our capacity to model our own relationships with others (the one-argument form of relationship-A). There is, however, a

considerable difference between the two forms. Relationship-A represents the capacities to reliably identify other individuals, and to associate emotional tags with those individuals; and both of these capacities seem to be evolutionarily quite ancient (e.g. Cooper *et al*., 2003). These relationship-A models are intimately personal: they represent our own image of the other individual, and our own emotional reaction to that individual; the modelled other and the emotions attached to that modelled other are closely intertwined.

This contrasts with the A-relationship-B model, where the images of the other individuals and the modelled emotional relationship between them are not our own images of, and relationships with, those individuals. Personally, I may be friendly with both Alf and Beth, but I have to be able to model their emnity as something separate from my own emotions. This also means that my model of Beth's image of Alf has to be different from my own image of Alf; but the two images also have to represent the same individual. This problem multiplies as the number of group members increases: I have to try to retain models of everyone's images of everyone, and somehow produce a coherent understanding of the actual relationships in the group. Where relationship-A modelling requires a simple social arithmetic, A-relationship-B modelling requires a social calculus, or computational grammar.

So in this modelling of group relationships we have a complex cognitive activity that requires many of the functions that typify human language. It involves segmentation, in that the modelled individuals and the modelled relationships have to be slotted into a standard form of A-relationship-B; it involves differentiation, in that the relationships and modelled individuals serve different functions in the standard form; it involves abstraction, in that the relationship A has with B is distinct from my relationships with A and B; and it can involve directionality, in that the relationship in A-relationship-B may not be the same as in B-relationship-A. This last function may rely on the capacity to attribute false beliefs to others, a capacity which chimpanzees do not share with us (Call & Tomasello, 2008); and which, therefore, may be exclusively human – at least in terms of current primate species.

A-relationship-B calculus is, however, quite ancient in other ways. Cheney and Seyfarth (2007) show how modern baboons (*Papio hamadryas ursinus*) maintain social hierarchies in which each baboon knows their place. They must give deference to those above them to avoid confrontation, and they expect deference from those below them. The hierarchy is linear and, by itself, it involves simple relationship-A modelling. However, baboons also keep track of the interactions of others in their group. They are able to identify who is making a call from the call itself, and they pay more attention when, for instance, a threat bark from a subordinate is followed by a fear bark from a dominant. Female baboons also seem to understand a hierarchy of families overlaying the individual hierarchy: after a confrontation, reconciliation with another member of the antagonist's family counts as a reconciliation with the antagonist.

The best explanation for this is that baboons have a cognitive social calculus of A-relationship-B constructs, although they do not use this calculus in their communication. This may be because all baboon signals collocate with the event or object being signalled, as seems to be the case for all nonhuman primates; but the value in communicating A-relationship-B constructs is that they can be signalled when the events and objects are not present. The

capacity to reference absent, and therefore irreal, objects and events is another capacity which may be exclusive to humans among current primate species.

The question for the evolution of language, therefore, is not how A-relationship-B constructs became part of our social cognition, but what led to them becoming communicable. The answer to this question is likely to involve the development of a whole series of cognitive and physical capacities which all need their own explanation. However, the long time period between the likely appearance of social calculus in cognition and its use in communication provides a relaxed timetable for the evolution of all of the necessary capacities. The six million years from the chimpanzee-human common ancestor to modern humans is time enough.

For instance, there is enough time for a full phonological explanation, from complex sounds being made as costly signals (Gintis *et al*., 2001), through an attentional language-like phonology (MacNeilage, 2008), into a situation where the complex sounds take on their own arbitrary meanings (Hurford, 2007).

There is time for the development of a fully co-operative culture, involving vigilant sharing to ensure equitable distribution of resources (Erdal & Whiten, 1994), reverse dominance to suppress alpha behaviour within groups (Boehm, 1999), and co-operative signalling based around modelling the needs and expectations of the signal receiver (Dessalles, 2007). This emphasis on overt collaboration over competition would create a species in which co-operation is the norm, and may well lead to non-co-operative behaviour being altruistically punished (O'Gorman *et al*., 2009).

Vigilant sharing can also lead to joint attention, turning the individual's attention outward onto shared events and, in turn, leading to co-operative deixis (Tomasello, 2008). This generates an environment where cultural transmission of complex skills becomes possible: intentional teaching and learning can happen, and a cultural "ratchet effect" can take hold (Boyd *et al*., 2011). Knowledge becomes robust: it is duplicated across several brains, ensuring that it is not lost when individual brains die.

Within the six million years, then, there is enough time to explain the co-evolution of co-operative human culture and the signalling system needed to support that culture. How this co-evolution could have happened has generated many complementary and competing explanations (e.g. McNamara *et al.*, 2008; Ambrose, 2010; Pinker, 2010; Jablonka *et al.*, 2012); as a process, therefore, it should not be seen as either simple or inevitable. However, while there is currently no single explanation for the co-evolution, the timescale means that we do not need to introduce a sudden or catastrophic evolutionary event to justify its development.

There is also time in the six million years to explain the complex role of tool-making and tool-using as features of language development. Language, as Austin (1962) showed, is just another instrument for doing things: it is a way of co-opting the muscle-power of others to achieve your own ends. The cognitive processes which we employ to create and use tools are very similar to those we employ to create and use language. Whether directly, using the same neural circuits, or indirectly, using similar neural circuits, our relationship with tools is likely to have influenced our relationship with language.

Sharing social relationships

None of these effects, by themselves, required a language-like communication system; but they did set the scene, leading up to the point when humans first began to share ideas that did require productive complexity, such as social calculus. This was, of course, the moment when we began to use gossip as a social lubricant (Dunbar, 1996); so it is likely that the sharing itself was motivated by the need to create new ways of grooming, or socialising with, each other.

An interesting feature of this sharing of social models is that it doesn't necessarily rely on truth-values. Any information you share with me about your perception of the relationship between Alf and Beth tells me something about your own relationship with each of them, regardless of whether the utterance represents the actual relationship between Alf and Beth. There is useful information in your utterance beyond what the utterance says, a "meta" level which makes the utterance worth listening to regardless of direct semantic content. Because the receiver is listening to the sender as well as the message, the mere act of utterance creates value in the utterance.

This new way of meaning changes the signalling costs and benefits for both sender and receiver. Utterances can be cheap (and potentially dishonest) in terms of their direct message, while still being costly to the sender (and valuable to the receiver) in terms of their metamessages. In this environment, the true cost of information-giving is reputation, backed by altruistic punishment (Fehr & Gächter, 2002), which will tend to keep the direct message honest; but the difficult-to-fake information in the metamessages means that dishonesty in the direct message may not actually matter to the receiver.

Once A-relationship-B utterances are being exchanged, other cognitive and linguistic capacities begin to emerge naturally from the signalling environment. These include:

- Reflective selfhood – when someone offers me a social model that includes me as one of the protagonists, I have to be able to make an image of myself as a third party in the same way I make third-party images of others;
- Grammatical persons – when images of other and self are part of communication, the privileged communicative roles of sender and receiver need to be recognised and modelled;
- Temporality and modality – once the irrealis boundary of absent reference has been crossed, and the need for signal accuracy has been mitigated, it is possible to introduce information which is not current, or even not actual;
- Recursion – because of the conditionality of truth in the offered models, tagging received A-relationship-B models with the identity of the sender (C) provides deniability when they are re-broadcast; which, in turn, means that tagging received A-relationship-B-by-C models with the identity of the sender (D) becomes valuable … and so on. In theory, this iteratively nested tagging requires – or provides – the infinite recursion proposed by Hauser *et al*. (2002). However, as Dunbar (2004) shows, the number of nested levels actually possible is heavily constrained.

These capacities can emerge naturally out of the sharing of social models, using cognitive mechanisms developed for other purposes (Edwardes, 2010 & 2014). The cognitive

mechanisms to represent them have already developed for other purposes; so, like the sharing of social models, they do not each need their own genetic explanation. While they extend the range and power of language, they do not rely on a cognitively specialised language engine for their expression. Instead of language appearing catastrophically as a single integrated system, it emerges piecemeal as a series of responses to particular communicational needs.

Conclusion

This paper started with a specific question: what particular communicational activity required the suite of functions that typifies human language? While the sharing of social relationships may not be the only answer possible, it does seem to satisfy many of the issues that an attempt to answer this question inevitably raises. It does not need a special genetic explanation because it seems to be a relatively ancient cognitive mechanism; and, because it does not rely on special genetic explanations, it can be incorporated into a standard model of human evolution. In terms of communication, it does not require novel cognitive systems; and, while it does rely on a new communicative need, that need is justifiable in fitness terms. Finally, the sharing of social relationships is itself a productive explanation for other aspects of being human, such as our capacity to model ourselves objectively.

Shared social calculus may not be the final answer to the question posed above; but, like any scientific hypothesis, it hopefully provides an effective working model until something better comes along.

DISCUSSION DOCUMENT

Mapping the Routes to Language

If the last twenty years' work on language origins has taught us anything, it is that there is no simple solution. Despite the hopes of some early writers, no single event has emerged as a candidate for the moment we "got" language; and, indeed, no single aspect of language has proved to be indisputably exclusively human. What we seem to be looking at, in terms of language origins, is a slow process of many steps rather than a single, sudden event.

This outcome was foreshadowed in the first Evolang proceedings (Hurford et al., 1998). In this volume, the papers were divided into three sections, the first on social aspects of language, the second on phonology and gesture, and the third on syntax. This volume foreshadowed the current language origins debate in other ways, too: many of the current preoccupations (mimesis, Donald; Theory of Mind, Dunbar; altruism, Dessalles; primate signalling, Ujhelyi; phonology, MacNeilage; semantics, Carstairs-McCarthy; evolutionary adaptation, Kirby; and self-organisation, Steels) are represented by papers in this volume.

In comparison, the proceedings of Evolang 8 (Botha & Everaert, 2013) feel quite different. There are general papers, but there are also papers that address quite specific issues (among others: multi-channel communication, Christiansen; segmentation and sequencing, Senghas *et al.*; semantics, Gärdenfors; FoxP2, Langus *et al.*; and number, Wynn *et al.*). There is, though, no grouping of topics: the divisions between the specialisms of language origins no longer seem to be useful.

One thing that has disappeared is catastrophic discontinuity. The arguments in Aitchison's (1998) review of the continuity-discontinuity debate seem to have been settled: catastrophic discontinuity is no longer needed to explain the appearance of language. Even Chomsky, a staunch supporter of catastrophic discontinuity, has accepted that language is, in large part, continuous with capacities in other species. He still reserves recursion, or MERGE, as a human-only capacity; but even here he is ambivalent about the origin of MERGE, its function outside language, and how it became linguistically useful (Hauser *et al.*, 2002).

The end of the continuity-discontinuity debate has created a new awareness about language evolution: whatever the story is, it is long and complex. Instead of looking for single magic accidents, the main efforts now are on explaining a series of significant events, concentrating on when they occurred and in what order.

It seems, therefore, that the field of study has matured – although we still do not have a viable explanation of language origins, and there is much work ahead. As Winston Churchill said, after the allied victory at El Alamein (November 1942), "Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning".

The "Sharing of Models" Model

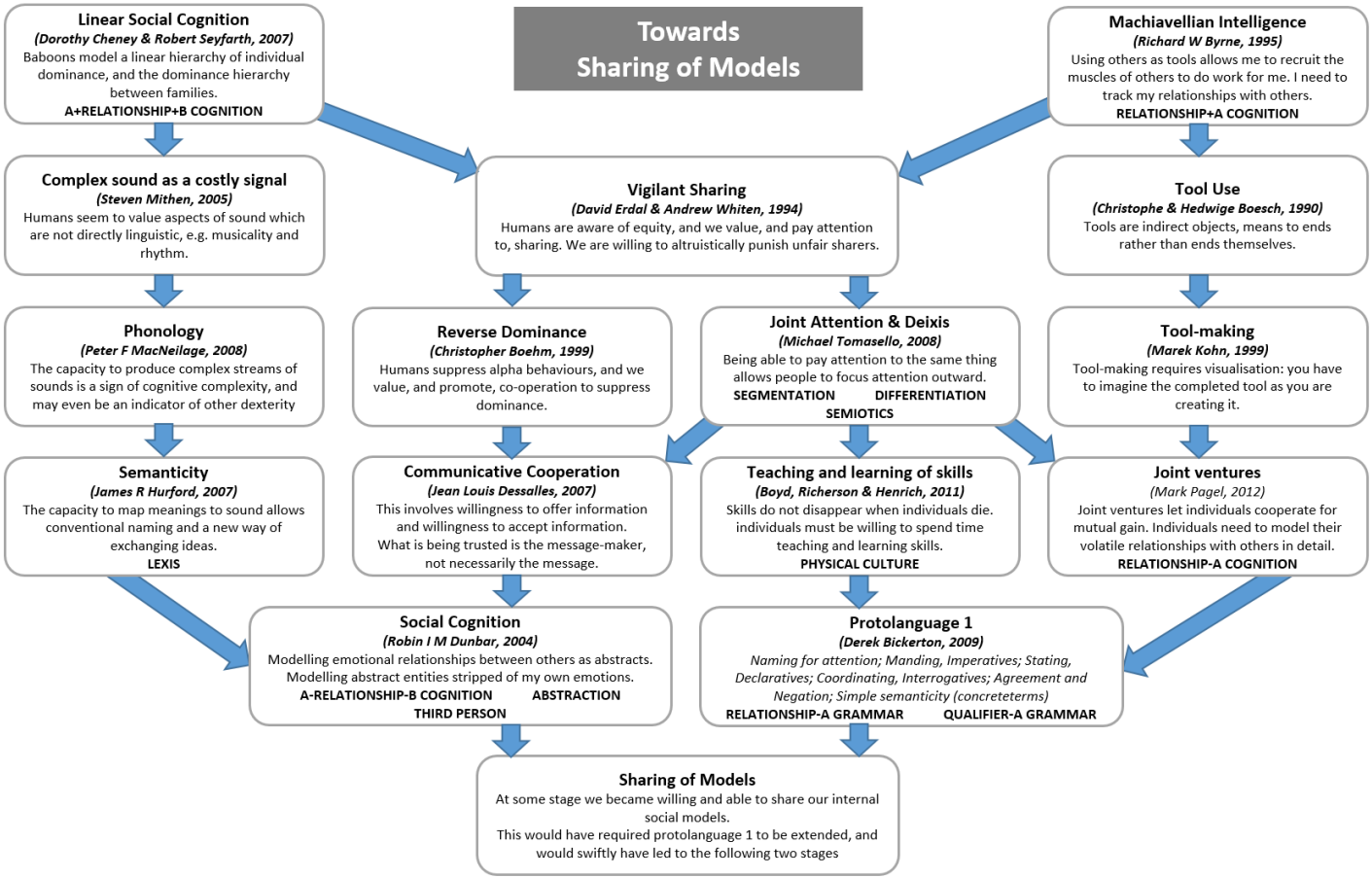
What is presented here is an attempt at describing a metamodel of language origins. The intention is to produce a topic for discussion and not a definitive map of how language evolved. The route to language described here illustrates how a comprehensive theory of language origins could be structured, not how language actually originated.

The approach used in this model is cognitivist, so the proposal makes certain basic assumptions. All of these assumptions are disputed, so it is important to make them explicit:

- Language is not a single system with a single origin.
- Language exapts existing cognitive and sound-making systems, it does not rely on novel, language-specific systems.
- Language has meaning (lexis and semantics), structure (grammar and syntax) and phonology (sound and gesture). Any comprehensive attempt to describe language origins should address all of these.
- Language is a social phenomenon, and this must be included in any explanation of language origins.
- Language is a tool, it changes its environment. This also needs to be explained.

The model shows a series of capacities, given in a rough order and with dependencies indicated. A timescale is not indicated, but the first two rows can be considered as pre-australopith. The next two rows are also pre-australopith, but the human lineage seems to have been more skilled at them than other lineages. The fifth row onward may be exclusively human, but when these capacities evolved, and in which species, is not discussed.

The "sharing of models" model should be viewed as a hypothesis (or, to be more accurate, a hypothesis about a hypothesis), and criticisms and suggestions for improvement are most welcome. If this project is of interest, or if you have any thoughts about it, you can contact me at **martin.edwardes@btopenworld.com** to discuss it further.



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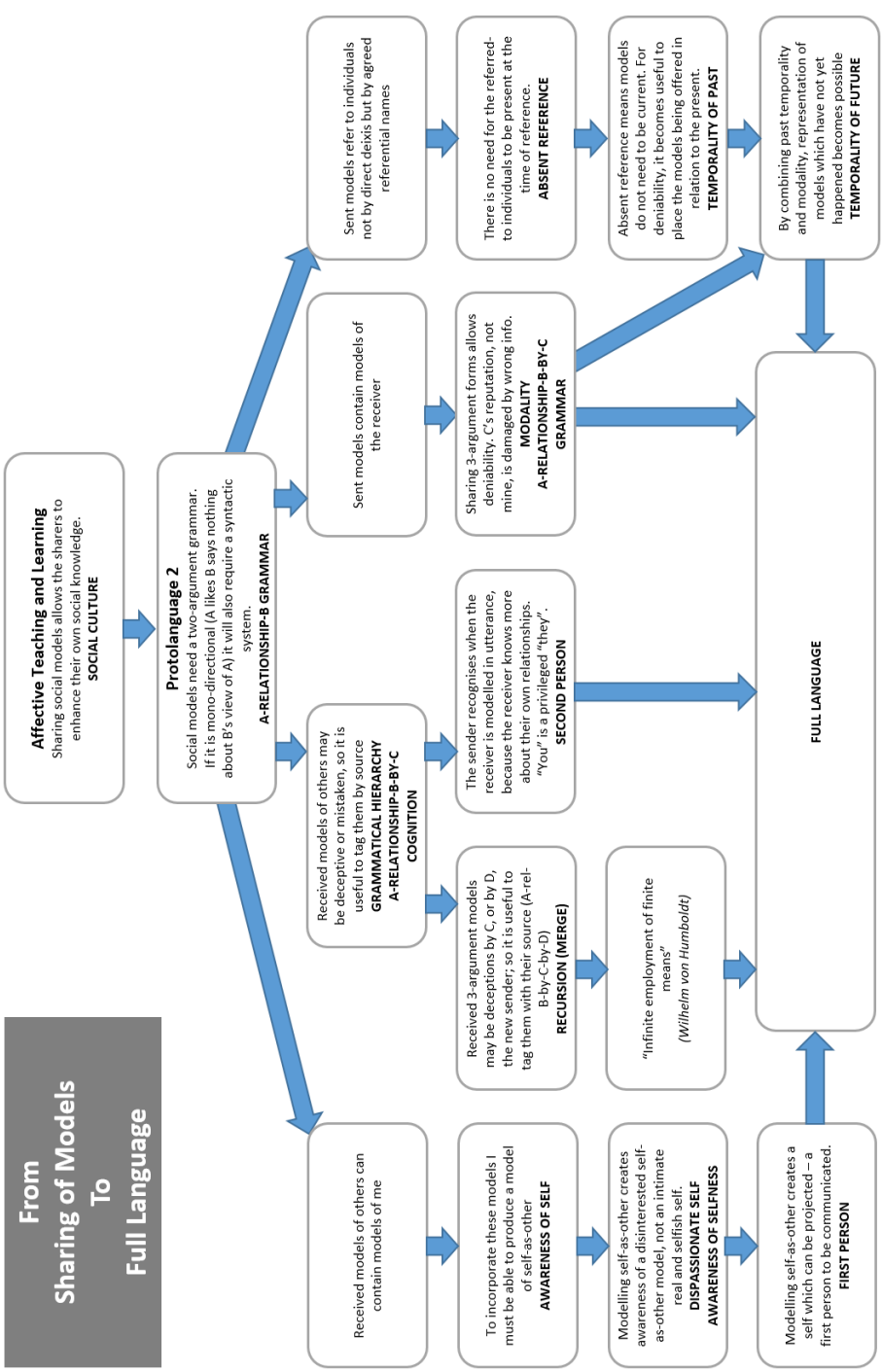
From
Sharing of Models
To
Full Language
Affective Teaching and Learning
Sharing social models allows the sharers to enhance their own social knowledge.
SOCIAL CULTURE
Protolanguage 2
Social models need a two-argument grammar. If it is mono-directional (A likes B says nothing about B's view of A) it will also require a syntactic system.
A-RELATIONSHIP-B GRAMMAR
Sent models refer to individuals not by direct deixis but by agreed referential names
There is no need for the referred-to individuals to be present at the time of reference.
ABSENT REFERENCE
Absent reference means models do not need to be current. For deniability, it becomes useful to place the models being offered in relation to the present.
TEMPORALITY OF PAST
By combining past temporality and modality, representation of models which have not yet happened becomes possible
TEMPORALITY OF FUTURE
Sent models contain models of the receiver
Sharing 3-argument forms allows deniability. C's reputation, not mine, is damaged by wrong info.
MODALITY
A-RELATIONSHIP-B-BY-C GRAMMAR
Received models of others may be deceptive or mistaken, so it is useful to tag them by source
GRAMMATICAL HIERARCHY
A-RELATIONSHIP-B-BY-C COGNITION
The sender recognises when the receiver is modelled in utterance, because the receiver knows more about their own relationships. "You" is a privileged "they".
SECOND PERSON
Received 3-argument models may be deceptions by C, or by D, the new sender; so it is useful to tag them with their source (A-rel-B-by-C-by-D)
RECURSION (MERGE)
"Infinite employment of finite means"
(Wilhelm von Humboldt)
FULL LANGUAGE
Received models of others can contain models of me
To incorporate these models I must be able to produce a model of self-as-other
AWARENESS OF SELF
Modelling self-as-other creates awareness of a disinterested self-as-other model, not an intimate real and selfish self.
DISPASSIONATE SELF
AWARENESS OF SELFNESS
Modelling self-as-other creates a self which can be projected – a first person to be communicated.
FIRST PERSON

GLOSSARY OF LANGUAGE EFFECTS ON DIAGRAMS (IN CAPITALS)

A+Relationship+B Cognition: I have models in my mind of the dominance relationships between other individuals in the group. As there is a stable linear hierarchy in the group, the relationships are largely invariant, so the binding between the imaged individuals and their relationship with each other is strong.

A-Relationship-B Cognition: I have models in my mind about the relationships between other individuals in the group. The reverse-dominance cultural environment means that my relationships are contingent and variable, so the binding of the relationship to the imaged individuals is weak.

A-Relationship-B Grammar: I am expressing my A-Relationship-B cognition verbally, so I need a simple syntactic system with which to do this.

A-Relationship-B-by-C Cognition: By tagging a received A-Relationship-B model with its source, I can measure it against my existing knowledge to identify C's stance towards A and B. This enhances my knowledge of the group social relationships, and allows me to extract useful empirical data from an utterance that is, essentially, opinion.

A-Relationship-B-by-C Grammar: I am expressing my A-Relationship-B-by-C cognition verbally, so I need a more complex syntactic system with which to do this.

Absent Reference: I am referring to items and events which are within my experience but not within yours. You have to accept their reality to me to be able to interpret my utterance.

Abstraction: I have to be able to see another individual as separate from my relationships with that other, so that I can model the relationship between that other and third parties.

Awareness of Self: I am a third party in the modelling of others, so A-Relationship-B constructs offered to me may include me as A or B. To incorporate these offered constructs I have to be able to model myself as a third party.

Awareness of Selfness: By modelling myself as a third party, I am able to see my self from an external perspective. This carries with it all the concomitant advantages and disadvantages of Machiavellian Intelligence, but applied reflexively.

Differentiation: The second of the four features of language. The "atoms" of cognition can have different roles in the construction of thoughts. In the minimal case of language (as conceived here), "words" can represent entities or relationships between entities.

Dispassionate Self: By modelling myself as a third party, I can treat my self as I treat other third parties.

First Person: Probably the last of the language "voices" to emerge. Allows me to represent my self in utterances made to others.

Full Language: A deeply deceptive term as language is, even today, a developing system. It represents the end of the story being told here, but it should not be seen as a complete, terminal state.

Grammatical Hierarchy: The third of the four features of language. The "atoms" of cognition can be combined to make composite units which behave in many ways like "atoms".

Lexis: "Words" represent a relationship between phonology and meaning. In this they differ from "atoms" of cognition, which have no phonology.

Modality: Utterances can have conditionality (they are true if…); they can have perspective (they are true to some individuals and not others); they can have fictionality (they are

true only within a non-existent scenario). If one type of modality is possible for a species, all types are possible.

Physical Culture: A species which is able to transmit physical survival skills between individuals by teaching and learning has a physical culture. The transmission of termite fishing between female chimpanzees and their offspring is an example of this.

Qualifier-A Grammar: Instead of representing my relationship with A, I can express it as an attribute of A (e.g. "hates Bagginses" becomes "nasty Bagginses").

Recursion (Merge): The fourth of the four features of language. Hierarchy can occur at multiple levels: composite units can contain composite units. The Hauser-Chomsky-Fitch (2002) proposal sees recursion as a language-related evolutionary event, but this proposal sees it as emergent from hierarchy and attribution of received utterances, with a genetic explanation outside of language.

Relationship+A Cognition: I have models in my mind of my relationships with other individuals in the group. As the models represent my actual relationships, the binding between the imaged individual and my relationship with them is strong.

Relationship-A Cognition: I have models in my mind of my relationships with other individuals in the group. The reverse-dominance cultural environment means that my relationships are contingent and variable, so the binding between the imaged individual and my relationship to them is weak.

Relationship-A Grammar: I am expressing my Relationship-A cognition verbally, so I need a segmented and differentiated system with which to do this.

Second Person: Probably the second of the language "voices" to emerge. Allows me to represent the receiver as a special class of "they". This permits referential dialogue, and "talking to" as an enhancement to "talking about".

Segmentation: The first of the four features of language. Utterances are composed of "atoms" of cognition, they are not monolithic correspondences between thought and signal.

Semiotics: Joint attention allows the emergence of shared representation. This, in turn, requires a shared convention of representation.

Social Culture: A species which is able to transmit social conventions between individuals has a social culture. The social conventions do not directly enhance individual fitness, but they create social inclusion for the individual, which indirectly enhances their fitness. Burial practices provide an example of this.

Temporality of Future: Being able to reference events which are in the past, coupled with modality, allows reference to events which are yet to happen. All that is needed is a social convention to identify future events.

Temporality of Past: Being able to refer to events which are not present means being able to refer to events which are not current. All that is needed is a social convention of how to differentiate current non-present events from non-current non-present events.

Third Person: Probably the first of the language "voices" to emerge. Allows me to represent others as entities, initially in my cognition and later in my signalling.

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