

6SSEL045 – Language Origins

Lecture 8

Co-operation & Sharing

This week we look at a range of topics under the headings of co-operation and sharing. These two aspects of being human are key to understanding the distance between being human and being any other species. This distance may appear large, but it is explicable: it is made up of a series of small steps away from the rest of the primate lineage. Therefore, while the final distance may seem difficult to explain, the steps by which it came about are all reasonable and comprehensible.

FROM AUSTRALOPITHECUS TO OSTENSIVE-INFERENTIAL COMMUNICATIONS

In terms of the **EAORC Routes to Language** chart, what we are looking at today covers a wide range of ancestral species, and over two million years of evolution. We start with the capacities of *Australopithecus* and end with *Homo heidelbergensis*, just one step sideways away from *Homo sapiens*; and we cover a wide range of topics: the development of language as sound (Costly signalling, Phonology, and Mimicry), the development of sharing (Vigilant sharing, Political singularity, Reverse dominance, and Communicative co-operation) and the development of co-operation itself (Large social groups, Increased encephalisation, Joint attention and deixis, Teaching and learning of skills, and Joint ventures.) There are a lot of topics to cover, but they are important because they are all about negotiation toward meaning, and they set the scene for the “final push” forward into modern human language. This is, therefore, perhaps the most important lecture in the module.

COMPLEX SOUND, PHONOLOGY & DECEPTIVE MIMICRY

The evolution of vocal skills was explored in lecture 5, where it was shown to be one aspect of human multimodal communication (the vocal channel is only one way to use language). Gestural communication is commonly used by most hominids (e.g. Call & Tomasello, 2007), and the idea that human communication went through a stage where gestural communication was more important than vocal is supported by many language origins researchers (e.g. Armstrong et al, 1995; Corballis, 2002; McNeill, 2012; see Kendon, 2017 for a synthesis). These ideas are not explored in detail here; instead, we are looking at some of the ways in which the sounds of language could have developed through music and mimicry. Complex vocalisation is necessary for spoken language; but spoken language, the outcome of complex vocalisation, could not have been the cause of complex vocalisation.

Peter MacNeilage (2008) looks particularly at the development of the human phonological equipment in the evolution to language. He sees it as a series of six stages:

- In “Deep Time”, speech began as an ordinary primate vocal signalling system.
- We developed framing, associating particular events with particular sounds on an ad hoc basis.
- We developed content, adjusting frames to account for detailed differences between events of the same type.
- We began to associate patterns in the frames with particular meanings, creating a primitive version of words.
- We began to evolve the brain organisation needed for speech as the dual frame-and-content system became a key feature of our cognition.
- Finally, we developed the cerebral hemispheric specialisation required for speech.

Except for the final step, his explanation is reasonable. Hemispheric specialisation is common in humans; but, with about 14% of the population having language in the “wrong” place without an obvious cause, it cannot be treated as anything more than a neurological curiosity. Language does not rely on any particular part of our brain,

although cognitive organisation does seem to default to a particular map; but that preference is habit, not necessity. Bedrooms were originally put upstairs in cold countries because heat rises; nowadays, with modern insulation, it is just a cultural curiosity.

Steven Mithen (2005) takes another approach. He considers how vocal complexity could arise without language (an important problem, because the capacity to make language had to precede the actual making of it), and he looks at wordless singing as a possible precursor. He recognises that, today, the two vocalisations (singing and speaking) are treated as quite separate, but his interest is in the origin of vocal complexity, not language as such. He proposes several reasons why music might be used in ways that could select for vocal complexity:

- **Singing to babies to entertain them.** Today this is viewed as an important part of language-learning.
- **Using music as a mystical tool**, for healing and to control uncontrollable nature.
- **Using music to keep a social group in contact** when it is spread out foraging; Mithen calls this ‘HmMMM’ communication.
- **Using music as a source of rhythm;** Mithen links this to bipedalism and dance – he is probably right about dance, but he is anachronistically wrong about bipedalism, which was a much earlier development.
- **Using music as a way of imitating nature**, allowing communication about events in the nonhuman world.
- **Using music as a costly signal of fitness:** I am able to hold a tune so I have vocal and breath control so I will make a good mate. It is also possible that singing represents a more general signal of fitness, such as generosity.
- **Using singing to unite a social group.** This is certainly a key feature of modern human singing, with some people singing only at group occasions – a football match, a birthday party, a church service, etc. Singing certainly seems to be effective in this role.

If our precursor species had an aesthetic interest in sounds, then individuals able to produce them would be more successful at getting their genes into the future; and an evolutionary impetus toward more complex vocal production and control would be the result. This is likely because that aesthetic interest in human-produced sounds is still with us today.

In an analysis of more modern human sound-making, Jerome Lewis and Chris Knight (Lewis, 2009, 2014; Knight & Lewis, 2014a, 2014b) bring Mithen’s and MacNeilage’s ideas together. They look at modern hunter-gatherer use of complex sound-making, and their hypothesis has two components:

- Firstly, that wordless singing (used by women to keep wild animals away) could have evolved into a grammatical system. This is an extension of Mithen’s singing theory.
- Secondly, that hunting calls which mimic animal noises (and therefore attract the animal) could have become representative symbols for the animal itself. This is an extension of MacNeilage’s phonology theory.

Both animal mimicry and wordless singing are part of the sound-making repertoire of current pygmy hunter-gatherers (the Baka), which makes this idea an interesting new approach, likely to be an important part of the sound-making story of language origins.

VIGILANT SHARING

One important event in the suppression of alphas was vigilant sharing (Erdal & Whiten, 1994). Vigilant sharing requires a sense of fairness and a capacity for outrage at being treated unfairly. Some monkeys seem to have this capacity (Brosnan & de Waal, 2003), so it is likely to be ancient in our lineage.

Vigilant sharing involves a sense of fair play being employed by both the sharers: they need to be aware of the agenda of others, and that not sharing will invite penalties; but they must also control their own greed. This seems to involve the capacity for social rule-making: we are working together because we are co-operating. The causation is, in fact, rather simpler: we are working together because it is less costly than not working together. Nonetheless, a lot of our social rule systems, legal, cultural and social, rely at base on our capacity for vigilant sharing.

POLITICAL SINGULARITY: SUPPRESSING THE ALPHAS

A major difference between human culture and chimpanzee culture is that we operate much more equally. In chimpanzee society, the dominant male maintains his preferential access to females by intimidating his rivals and cultivating his allies. Alliances are always provisional, though, because the dominant individual will be challenged if he shows weakness; and it is possible that it will be one of his allies that makes the challenge.

In bonobo society, the same thing happens, but it is a female that is dominant. This means that conflicts are less frequent and less dangerous (the female investment in future generations is much more protracted than that of males, so survival is much more a part of reproductive success); but they are still struggles for alpha control.

Humans seem to have suppressed struggles for dominance in our societies. This does not mean that we do not have dominance, but the dominance we have is group-versus-group rather than individual versus individual. Alphas can still emerge in human societies, but they are always reliant on group support. According to Dessalles (2014), this is because humans developed dextrous throwing, which meant that we could kill at a distance: a weaker member of a group may not be able to challenge for the leadership, but they are able to kill the leader without challenging if they don't like the leadership offered.

REVERSE DOMINANCE

As well as vigilant sharing, an important event in the suppression of alphas was reverse dominance (Boehm, 1993). Reverse dominance is a social system whereby individuals who attempt dominance are punished by a coalition of others. Only humans seem to have this.

Reverse dominance can only happen after the political singularity, when the group becomes more significant for individual survival than other individuals; and it relies on three characteristics: benevolence, the willingness to help others in need; generosity, the willingness to offer more than just the minimum; and altruism, (the willingness to put others above the self). We can therefore identify reverse dominance, on one level, as humility; but it is, on another level, all about self-interest and, most importantly, getting genes into the future. The competent, self-effacing individual becomes more valuable to the group than the bombastic praise-hog, and therefore more attractive to the members of the group.

COMMUNICATIVE CO-OPERATION

The outcome of the development of vigilant sharing, combined with the political singularity and reverse dominance, is a group-wide conditional co-operation, and a communicative system able to share reputations for co-operation. The sharing of reputations can increase or reduce the value of an individual to the group regardless of that individual's self-publicity, so it considerably alters the nature of the primate communication system.

Several indicators point to communicative co-operation as an evolutionarily effective strategy:

- Boyd et al (2010) show that co-operation can prosper when cheats are punished, if the punishment is shared between members of the group.

- Puurtinen & Mappes (2009) argue that the problem of individuals cheating on their share of punishment (freeriders) is overcome by competition at the group level. This increases co-operation within a group, and it intensifies the moral emotions of anger against freeriders and guilt when freeriding. Paradoxically, it seems, human co-operation within groups relies on competition between groups.
- Brosnan et al (2010) show that there seems to be an inverse relationship between co-operation and cognition in nature, indicating that co-operation is a way out of the costly need for ever-larger brains to support ever-increasing individual intelligence.

LARGE SOCIAL GROUPS

Large social groups are a prerequisite for modern human societies, which can number in the millions. Robin Dunbar has proposed that there is a relationship between brain size and group size, and it is likely that this is roughly true for hominins from Australopithecus to Neolithic Homo sapiens (e.g. Aiello & Dunbar, 1993; Dunbar, 1998; Dunbar & Schulz, 2007). However, it is unable to explain group sizes in the millions.

Instead, there must have been a large increase in trust and tolerance in Homo sapiens relative to previous hominins, or a redefinition of what co-operation means. So far, this aspect of Homo sapiens group size remains largely unexplored. Sober & Wilson (1998) propose an increase in altruism, although without good evidence; Pagel (2012) proposes human culture as the cause, but does not identify the particular aspect of culture that created the increase in trust and tolerance; and Lieberman (2013) sees the cause as a cognitive enhancement to socialisation, although he does not provide a genetically feasible target for investigation. The cause of mega-crowding in modern humans remains an unsolved question, but it is outside the time-span of this module, so will not be considered further here.

INCREASED ENCEPHALIZATION

Despite Dunbar equating group size with brain size, increased encephalisation is unlikely, by itself, to have allowed us to live in larger groups; instead, it was more likely that the need for larger groups drove the need for larger brains. Brains are too costly to increase on the off-chance they might become useful. However, for whatever reason, increased brain size was a feature of the hominin clade: in just over two million years, cortical sizes rose from the chimpanzee-like 350cc brains of Australopithecus, to the 700cc of H.habilis, the 900cc of H.erectus, and the 1350cc of H.sapiens.

Brain size is not, by itself, a good guide to species cleverness: large animals tend to have large brains to deal with their large bodies, regardless of how clever they are. For instance, compared to the H.sapiens 1.4kg brain, an elephant's brain weighs about 5kg, those of killer whales about 6kg, and sperm whale brains weigh about 8kg. However, in a single clade, such as the hominin clade, brain size does give a rough guide to cleverness.

To compare clades, Jerison (1977) proposed the Encephalisation Quotient (EQ). This measured brain size in relation to complexity. Unfortunately, he found that this, too, did not provide a simple comparison across clades. For instance, some ant species have brain-to body ratios of 14%, compared to the human 2%.

A further complication is brain complexity – both in terms of surface folding and overall structure. For instance, bird brains do not have a surface cortex, they have a dense pallium (Emery, 2016), which allows them to be much more clever than their brain size would indicate. There is even some evidence that the recent drop in hominin brain size from 1500cc to 1350cc was accompanied by

reorganizational changes which maintained overall cleverness (Weaver, 2005).

One major problem with measuring cleverness is what we count as brain. Is it just the cortex? Plus white matter? Plus cerebellum? Plus the limbic system? Plus spinal cord? Plus the recently-discovered gut-brain neural circuit (Kaelberer et al, 2018)? This is complicated by the differences in brain organisation between species, meaning that it may be pointless trying to measure cleverness across a wide range of species using just brains.

JOINT ATTENTION & DEIXIS

Creating joint attention is not unusual in nature, any call or gesture which warns conspecifics of a particular danger can be seen as creating a joint attention by the warner and warned toward the danger; and to do this, the call has to somehow point out the danger to the warned.

However, human joint attention and deixis is more sophisticated than this simple system. We generate, and pay attention to, symbols as well as indexes. A vervet eagle warning call is an index of an eagle, it represents an actual bird and a real threat; in contrast, a red traffic light is a symbol of a likely problem and a series of possible threats – from encountering the problem itself to being prosecuted for not obeying the light. The idea that a light could have social force and be the cause of social sanctions would be inexplicable to most primates; but it is this joint attention to social, rather than physical, realities that makes our joint attention so different and so powerful.

TEACHING AND LEARNING OF SKILLS

Learning is likely to be a common skill in nature: the individual who can emulate the successful actions of a conspecific is more likely to get their genes into the future than one who cannot.

Teaching, though, seems to be much less common; many fewer species deliberately teach. It is, however, not limited just to humans.

- Thornton & McAuliffe (2006) show that meerkats teach prey-handling techniques to their young, using an example-and-practice methodology.
- Raihani & Ridley (2008) show that teaching is not limited to mammals: pied babblers teach a feeding call to their chicks to facilitate feeding.
- Franks & Richardson (2006) show that even ants seem to be involved in teaching and learning.
- Hoppitt et al (2008) suggest that teaching occurs in species with altruistic social systems, such as allocare, joint enterprise and self-sacrifice. This is why teaching is rare in nonhuman primates.
- However, Csibra (2007) points out that, while these examples demonstrate kinaesthetic learning in nonhumans, they would not work for transferring cultural knowledge. Csibra & Gergely (2006) suggest that advanced tool-making adapted humans for teaching and learning, making pedagogy in our species unique.
- Boyd et al (2011) argue that humans needed extensive learning and teaching skills to allow us to occupy new niches so quickly, and it was this that allowed us to expand into all parts of the globe in less than 50,000 years.

Teaching is clearly implicated in complex communication systems, and it is a skill that preceded language itself; but did it cause, facilitate, or just co-exist with language?

JOINT VENTURES & PLANNING

A joint enterprise is a task in which several people co-operate. This is a banal thing for humans – most of our activities are undertaken in groups, or constrained by group rules. Joint enterprise, though, is uncommon in nature. Several other species use dyadic co-operation, where one individual helps another with a task they are doing, but there is very little co-operative planning before acting; co-operation

does not extend to languagelike negotiation toward meaning. This means that roles are not agreed, they are extemporised out of the co-operation; and co-operation of groups larger than dyads is rare.

It seems, therefore, that extensive joint enterprise and co-operative communication are linked – both in their origin (joint attention and deixis) and in their outcome (ostensive-inferential communication). This type of communication is, like joint enterprise, reliant on the capacity to model the future; and, like co-operative communication, it relies on a level of trust between the communicators – a trust that the communicators have earned through their previous interactions. This level of trust allows the communicators to accommodate the needs of each other as well as their own needs – it is the beginning of the social contract which underpins human socialisation.

It is no coincidence that the most co-operative insects (the eusocial species: termites, ants, wasps and bees) also have relatively sophisticated communication systems: they, too, communicate co-operatively and work together in joint enterprises. It may be that they, too, are on the edge of ostensive-inferential communication.

Burkart et al (2009) add one extra feature to the story given here. They suggest that co-operative breeding in the hominin clade (in the form of shared parenting), led to greater prosociality, shared intentionality, and the psychological conditions needed for ostensive-inferential communication. However, shared parenting is not unusual in nature, many social mammals (e.g. meerkats, painted wolves, prairie voles) commonly allow alloparenting by members of their social group (who are often close relatives). This means that, by itself, shared parenting may not be sufficient to generate language, and that something else is needed. Nonetheless, shared parenting may have provided some of the impetus toward joint enterprise and co-operative communication, and therefore toward ostensive-inferential communication.

RED QUEENS AND RATCHETS

Is there a direction to this series of evolutionary events? And, if so, what mechanisms are behind that direction? Do we need to posit a directing entity? Or is the accumulation of co-operative strategies just the product of a series of unrelated random mutations? Burton Mikiel (1973) showed that, after the event, a random walk can appear to have been directional: even though each step is randomly generated, the result does not look chaotic. So it is entirely possible to view the evolution of co-operative communication as non-random even when it isn't. However, in the case of ostensive-inferential communication, two evolutionary effects mean that what may look directional could indeed be directional.

The first of these is **the Red Queen effect**, proposed by Matt Ridley (1993). This argues that competitions between defensive and offensive strategies lead to an arms race of improvements. A new defensive strategy forces the offensive side to develop ways around it; which forces the defensive side to develop a new defence; and so on. This effect is named after the Red Queen in *Through the Looking-Glass & What Alice Found There*, who forces Alice to run as fast as she can just to stand still. In the case of ostensive-inferential communication there are four arms races at work: increasingly complex sound-making, increasingly complex alpha suppression, increasingly complex cognition, and increasingly complex co-operation; and all of these are governed by the fitness advantages that being good at them brings.

However, this process could work equally well either way; if being good at cheating the system becomes a genetically fit strategy, then the whole system runs backwards toward Machiavellian mistrust. What stops it from doing so is what Hermann Muller (1964) described as **the Ratchet effect**. Once a particular skill or capacity becomes a reliable indicator of attractiveness then it is socially

difficult to reverse: it is attractive because the skill helps the receiver, who is the judge of attractiveness. In the case of ostensive-inferential communication there are four mechanisms, all working toward increasing complexity; metaphorically, each acts as a pawl on the ratchet wheels of the other mechanisms, preventing them from reverting to lower levels of complexity.

Complexity breeds complexity – literally; and that is a good thing.