6SSEL045 – Language Origins
Lecture 4
How Human Children Acquire Language

Between birth and age four, human children undergo a major redefinition of what it means to be human. From the genetic model of being human they become increasingly enculturated into a socio-cultural model of being human. Other animals undergo similar, although less extreme, self-redefinitions; but humans become markedly different socially, culturally, psychologically and in terms of selfhood. In part, this is possible because we are born **altricial**: we are severely underdeveloped versions of our adult form, particularly in terms of our cognitive abilities, and we require extensive carer intervention to survive our first four years. Many mammals are altricial (and marsupials even more so), but the period of human childhood is one of the longest in nature. This extended childhood may also be why we are **neotenous**: we extend many features of our childhood into adulthood – cognitive, social, psychological and even physical. Humans do not just "grow up", as most animals do; we are "raised".

Humans also seem to extend childhood at the other end, before birth: there is growing evidence that children are learning socially, culturally and linguistically in the womb during the third trimester. This means that when a human infant is born, it is an interpersonal work already in progress, it is not a work just begun. However, there has been no investigation of other species' learning in the womb, so we cannot say whether this is species-specific.

Language plays a considerable part in early human childhood, in terms of learning it, attending to it, and using it. This key role of language has led to speculation that the child's journey to becoming language-capable reflects the species' journey to language – what Ernst Haeckel (1912, p2) described as "**ontogeny is a recapitulation of phylogeny**" (child development copies species development). Phylogeny does not provide a full description of how children become adults, but it is a good approximation of what happens, and it does provide the right questions to ask about child language development.

LINGUISTICS PROBLEM 1: INNATE OR LEARNED?
The first of these "right questions" is: how much of language is learned through socialisation and communication, and how much is innate within us? This is one of the big debates in modern linguistics – although nobody nowadays takes either extreme position, that it is all learned or all innate. Nonetheless, linguists tend to divide ideologically into two camps about the learned/innate argument ("ideologically" means that their approach to this argument affects their ideas about what language is and how it works).

Nativism:
Nativism takes the view that the key features of language are innate. There may be minor aspects that are learned, but the reason we acquire language is because we have an innate cognitive mechanism which, once activated, does not allow us to do otherwise. Nativism is associated with the Generativist approach to linguistics, and the Modularist approach to neuropsychology.

For Nativists, language acquisition is easy to understand, because humans are designed to acquire language. We have special language modules in our brain that other species do not have, so not only do we acquire language because we must, other species are unable to acquire language because they do not have the capacity to do so.

The question of how language works is also, at first view, not a difficult problem. Chomsky proposed a double-black-box model, consisting of a Universal Grammar (UG) and a Language Acquisition Device (LAD): the first contains the universal rules system of language and the second gives us the capacity to activate that rules system. We do not need to know the details of either of the black boxes, all we need to know is that they convert inputs into outputs – and we can see how they do this by observing those inputs and outputs. Both UG and the LAD are complete and coherent systems (possibly one complete and coherent system), which can be described in terms of the transformations they produce rather than how they produce them.

This, however, raises a different problem: how does a complete and coherent system work in terms of brain and mind? How would it access inputs from, and deliver outputs to, other brain and mind systems? The rest of the processing in the human brain seem to be produced by massively parallel processes involving many brain areas; why does language have to work in a different way?

Another question, related to language origins, is: how could a complete and coherent system have evolved? Unless it appeared suddenly and in a very un-evolutionary way, it would have required intermediate states; but what would those states have been?

These two questions illustrate the central issue with a Nativist approach: it is theoretically complete but problematic in practical terms. Like phlogiston, it is an untenable solution when confronted with the evidence.

Acculturation:
For acculturation theories, the key features of language are learned. This learning may be based on innate tendencies to communicate and to learn, but those tendencies are generalised and not language-specific. In the acculturation model, acquisition is problematic: how does the child know that what is happening around them is language rather than other, non-communicative events; and how do they know that this is what they need to acquire for communication? Because the cognitive mechanisms used for language are not specific to language, they need to be explained in terms of general brain-mind structure and functionality: language must be able to piggyback on general cognitive functions, which must therefore contain all the functionality needed for language.

In contrast, how the system works in terms of general cognition is easy: it IS general cognition. Any interfacing needs are met because the "language modules" are just general cognitive processes exapted for communication: they are bootstrapped (self-organised) by their other cognitive functions, and they are naturally leaky – information for a variety of cognitive purposes is transferred using the same architecture and sometimes the same circuitry. There is also no evolutionary problem: language is produced by exapting systems evolved for other purposes. The appearance of these language systems in human evolution is an emergent feature of other evolutionary needs.

The theoretical positions of Nativism and Acculturation are mutually exclusive, but the genetic evidence for either position remains largely unexplored. This is mainly because, until recently, we only had genes from one member of the Homo clade: us. However, in 2006 Svante Pääbo's team published the first million base-pairs of the Neanderthal DNA map, and comparative genomics in the Homo clade became possible. We now have partial DNA profiles for Denisovans, H.erectus and H.heidelbergensis, and the origins of human language – and H.sapiens – have become more complex and more perplexing.

LINGUISTICS PROBLEM 2: PREFIGURED OR UNIQUE?
This is the second of the "right questions", and the cause of another big debate in linguistics: are the key features of language unique to humans, or are they all available to other species, although not necessarily all available to a single other species? The position taken on this question dictates your view of the continuity of humans with

the rest of nature: are we a unique species with unique brains, unique cognition, unique socialisation, and a unique role in the cosmos? Or are we just another type of ape with a little bit more brain, slightly different cognition, a greater capacity for socialisation, and no particularly special role in the cosmos? To put it another way, is language symptomatic of our difference from the rest of nature or of our continuity with it?

In terms of child language acquisition, the question becomes: is human language acquisition a mysterious new process in nature that needs its own unique explanation; or is it comparable to the communicative learning of other animals? We are only beginning to explore this dichotomy in detail, so we currently have no good evidence either way. It seems evident that human language is a different phenomenon from other communication systems we have encountered, but quite what constitutes that difference is slippery; every time something is isolated as "human-only", counter-evidence becomes available that it is prefigured in other communication systems. It is only recently that the communication systems of nonhumans have been deemed worthy of attention, but when we do look at them we find them to be more complex and more informative than we believed possible.

LINGUISTICS PROBLEM 3: FOR THINKING OR COMMUNICATING?

This is the third of the "right questions", and perhaps the most difficult to answer: is language mainly a tool for thinking or for communicating? Once again, nobody believes in the two extreme positions, but there is plenty of disputed territory in between those poles. The problem even subdivides into then and now: language may now be a tool mainly for thinking, but did it start out as a tool mainly for communicating? And there is room for several viable middle grounds: some features of language could have developed primarily for thinking, others primarily for communicating; or, thinking in language and communicating in language could use related but different cognitive processes; or, the mix between thinking and communicating could change through life, and particularly fast in childhood. All these options make it difficult to choose a position, but the position you choose affects your definition of what counts as language.

It is even possible to see the primary function of language as neither thinking nor communicating. It could, for instance, be a costly signal: "look at how fit I am: I can spout this nonsense and still survive and thrive better than people who talk sense". This may sound like a ludicrous idea, but consider Donald Trump's claim that "I could stand in the middle of Fifth Avenue and shoot somebody and I wouldn't lose any voters."

TWO CLASSIC MODELS OF LANGUAGE ACQUISITION

Child language acquisition has been modelled in different ways by different researchers. One of the earliest researchers was **Jean Piaget** (1959), whose model of childhood takes the view that there are four stages to a child's learning.

- **Sensorimotor stage:** from birth to age 2 years, children experience the world through movement and their senses, and they learn about object permanence. The language used is basic – identifying objects by naming, and maybe some simple object-action constructs.
- **Pre-operational stage:** from ages 2 to 7, the child is involved in the acquisition of semiosis (sign-meaning combinations) and adopting a "centre of attention". Initially they can only take an egocentric viewpoint, but during this stage they develop the capacity to take viewpoints outside of the self – non-personal viewpoints and the viewpoints of others. Language becomes more complex, allowing two- and three-argument forms, but it is still not fully conversational: the capacity to negotiate toward meaning is still incomplete.
- **Concrete operational stage:** from ages 7 to 11, children begin to think logically about concrete events. Language at this stage is complex, analytical and conversational; but it does not involve metacognition.
- **Formal operational stage:** after age 11, the child develops abstract reasoning. This permits full language.

Piaget's schedule of development is variable, not all children reach the transition points at the same age; but the development follows a fixed pattern. The problem with Piaget's model is that transitions between stages are not satisfactorily explained – what causes them, how do they occur, and how sudden are they?

Lev Vygotsky produced a different, two-stage model. Because he worked in the Soviet Union, his ideas did not reach the West until the mid-1980s (Vygotsky, 1986 [1934]). This turned out to be fortuitous because questions were being raised about Piaget's model, and alternatives were being sought. Vygotsky's two stages are:

- **Preverbal thought:** up to age 2 there is no language, only simple cognitive structures, and an incomplete understanding of communication.
- **Verbal thought:** after age 2 there is increasingly sophisticated language and cognition, and increasingly socialised awareness.

Vygotsky also proposed that what a child could learn was dictated by their **zone of proximal development** – what they already know dictates what they can learn next. Learning is a matter of developing understanding within a **scaffolding** of teaching. The scaffolding only works if it builds on understanding that is already in place. He said that the child learns from its culture, and child development reiterates cultural development: complexity and abstraction both increase as the child takes a fuller role in society.

The problem with Vygotsky's model is that the zone of proximal development is not properly defined: is it a single, general zone covering everything that can be learned next, or is it a set of separate zones, one for each area of learning?

CHILD LANGUAGE DEVELOPMENT

Four evidence-based analyses of child language have added to our understanding of how language is acquired.

In 1970, **Roger Brown** produced a classic diachronic study of child language development (a diachronic study looks at a small number of subjects over an extended period of time). He followed the language acquisition of three children over three years, and produced the following timetable:

- 0-6 months: the pre-language stage; there is no real evidence of language.
- 6-18 months: one-word utterances; the child is naming and drawing attention to objects.
- 18-36 months: two-word utterances; there is segmentation and differentiation in the child's language (mostly action/object) but no grammar.
- 36 months onward: fully grammatical language, although not a complete English grammar system.

In 1996, **Kathy Hirsh-Pasek & Roberta Michnick Golinkoff** published a series of synchronic studies of children's attention to sound, looking at groups of children at different ages (a synchronic study looks at large numbers of subjects in a short period of time). They produced the following timetable for child language acquisition:

- 0-9 months: acoustic packaging; the infant is learning how to make sounds and learning what sounds those around them are making. At this stage, the acoustic environment has two notable features: babbling by the child, and child-directed speech (motherese) by the carers.

- 9-24 months: segmentation and linguistic mapping; the child is learning to differentiate words and word-types. Carers tend to drop the use of motherese during this stage.
- 24-36 months: complex syntactic analysis is being acquired; one-, two- and multi-argument forms are being used.
- 36 months onward: the child is using full language; that is, they are producing simple but fully grammatical utterances.

Hirsh-Pasek & Golinkoff recognise that "full language" by age 3 is not complete language; complete language can take another decade to achieve. Pre-adolescents can still have problems with passive constructions, and with differentiating reflexive utterances from non-reflexive. Language learning is therefore likely to be incomplete in most individuals before puberty. There is also evidence that the teen brain undergoes a significant reorganisation, and this affects the form and complexity of utterances produced.

In the early 1970s, **Michael Halliday** made an in-depth diachronic study of the language development of his son, Nigel. His approach was Systemic-Functionalist, so he was looking for different markers of language acquisition than psychology studies usually seek. The study showed the following:

- 0-9 months: no systematic study was made.
- 9-12 months: Nigel demonstrated the following functions in his communicative relationships (the communication events did not necessarily use language): Instrumental (using the other person as an instrument); Regulatory (telling the other person what to do); Interactional (attracting the other person's attention); Personal (signalling the child's own states). Many communication events used more than one function.
- 12-18 months: the imaginative function began to be used (let's pretend).
- 18-36 months: the child began to use the heuristic function (wassat/wassis?).

The study ended when Nigel was 36 months old, but Halliday proposed the informative function (telling others about things) as occurring after 36 months.
Halliday described three stages of language learning:

- 0-24 months: Language learning.
- 24-48 months: Learning through language.
- 48 months onward: Learning about language.

In the late 1990s, **Eve Clark** conducted extensive synchronic studies of relatively large groups of children. She was looking mainly at vocabulary acquisition rather than language complexity, because the former is much easier to identify than the latter. She found:

- 0-12 months: children set up conceptual representations which are not language specific. However, this does not mean they represent universal categories.
- 12 months onward: children add linguistic representations and start discarding conceptual representations; they start learning the conventions of their community language.

In terms of vocabulary, Clark gave the following timetable:

- 0-24 months: vocabulary develops slowly to about 500 words.
- 24 months – 17 years: vocabulary increases at about 1,000-3,500 words per year. This means that by age 17 vocabulary size varies widely, from under 16,000 words to nearly 55,000 words.
- 17 years onward: vocabulary continues to increase, but at a slower rate (about 200-400 words per year).

So, according to Clark, the period of life when word acquisition is at its slowest is from birth to age two – the period during which conventional wisdom says that most language-learning is happening.

INFANTS DON'T UNDERSTAND MODELS

Other studies of the capacities of human children have shown that childhood cognition is different from adult cognition in important ways. Our early-life learning involves more than just acquiring language; but those other acquired skills can and do affect the language we are able to learn.

One of these studies looked at children's capacity to model reality: **Judy DeLoache** (2004) looked at how infants react to photographs. She found that they have difficulty differentiating the real from the realistic; they have problems understanding that scale changes the nature of an object; and they do not recognise the relationship between models and reality. We are not born with an innate understanding of representation and symbols.

Simon Baron Cohen (1995), in a study of socialisation in autism, showed that we are not born with innate social knowledge, we only develop Theory of Mind (ToM – the knowledge that others have their own agendas) at about age four. This development is not just learned, there are genetic components represented by the Autism spectrum; but an impoverished learning environment can have the same effect on ToM and socialisation as a genetic difference.

Paul Bloom (2002), in a series of experiments on near-newborn infants, showed that children seem to be born with an innate awareness that communication is a Good Thing, and that communication involves a dialogue with others. They are cognitively open to the idea that the word-sign is a negotiation toward meaning, and it is the role of the listener to try to apprehend the intended meaning of the speaker – although negotiation toward meaning itself is an acquired skill.

CHOCOLATE & SMARTIES

Three further research programmes are reviewed here to illustrate how the cognition of the child changes over time.

In 2001, **Sarah Brewer** conducted a series of televised experiments on children of different ages to assess their comprehension of time and their knowledge of others. One of these was the chocolate experiment, based on the earlier Marshmallow Test developed by **Walter Mischel**. In the chocolate test, a child is offered a piece of chocolate now or a bar of chocolate in ten minutes. Children under age 3 usually opt for the piece of chocolate now, while those over age 3 are willing to wait.

Another test, conducted by **Perner, Leekam & Wimmer** (1987) was the Smarties test. The subject is shown a Smarties tube and asked what is inside it. They usually say "Smarties", but they are shown that the tube actually contains a pencil. The subject is then told that another child (who they know and who is a similar age) will be coming in, and the subject is asked three things: what do they remember is in the tube; what did they originally think was in the tube; and what do they think the new child will think is in the tube. The correct responses are, of course, pencil, Smarties, Smarties; but under-3s often responded with pencil, Smarties, pencil – or even pencil, pencil, pencil. The accuracy of all three responses was greater for over-3s, but the responses showed something else as well. Some of the under-3s found it difficult to understand they themselves could be mistaken: they insisted that they originally thought the Smarties box contained a pencil rather than Smarties. Not only did they have the expected difficulty in attributing their former false knowledge to another, they also had difficulty attributing it to their former self.

Mildred Parten (1932) looked at children interacting (turn-taking) and used the data to extend Piaget's model of play. She proposed the following types of play:

- 0-24 months: Solitary play – the child plays by itself with its own objects.
- 24-36 months: Parallel play– the child plays its own game, but they may use the objects also being used by other children.
- 36-48 months: Associative play – Children begin to truly play with others. They share objects but may be following their own story line.
- 48-72 months: Co-operative play – children play together with a common script.
- 72 months onward: Intentional play –children recognise the intentions of others and consciously acquiesce in a shared play script; this often involves arbitrary rules limiting the players.

These types of play show an increasing capacity for social interaction, and an increasingly complex understanding of the minds of others.

Alison Gopnik, Andrew Meltzoff and Patricia Kuhl (1999) undertook a series of studies of children interacting. They produced a complex model of children's development in terms of socialisation, learning, and language; and they showed that the three are related. They described the experimental nature of child learning as "the scientist as child".

DEVELOPMENT THROUGH CHILDHOOD

All of these models of development throughout childhood tell us that:

- There is such a thing as development.
- There does seem to be a trajectory of development.
- It is a predictable physical trajectory, so probably innate in part.
- It is a socialised trajectory, therefore probably learned in part.
- Child development is predictable, so major variations from these schedules can be treated as pathologies.

What the chart does not tell us is that child development is highly variable – all of the time boundaries in the chart are fixed, but they can vary considerably between individuals without being pathological. The chart also gives the false impression that transitions from one state to the next are immediate; they are, in fact, gradual.

SUMMARY

- We still do not have a complete model of how we get from a pre-linguistic state to being fully linguistic.
- The "final" linguistic state achieved by adults varies widely in terms of lexis. It also varies in terms of grammar, but less so.
- It is likely that we have evolved to be genetically predisposed to communicate and learn language; but language has also developed to fit our existing genetic predispositions.
- The human brain seems to be communication-ready at birth, but it cannot be called linguistic at that stage.