

Animal Communication and Language Evolution



Donning his new canine decoder, Professor Schwartzman becomes the first human being on Earth to hear what barking dogs are actually saying.



What natural animal communication is like

"everything that follows is just a game. Are you ready to play?"

Canid Play Bow.



Displays are modulated in intensity or clarity of presentation, with similarly gradient implications for their "meaning."

Blacktailed prairie dog's Jump-Yip:

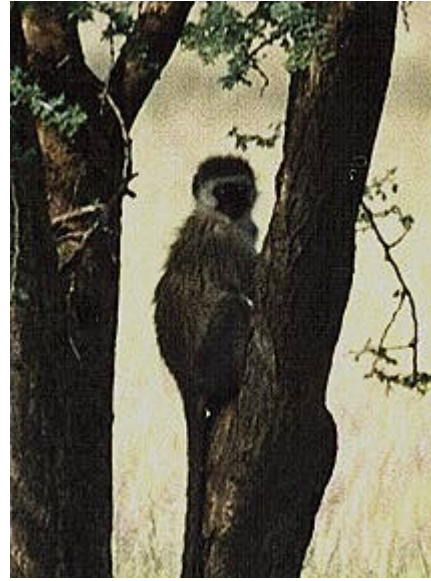
throwing the forepaws into the air, pointing the nose straight up, and emitting an abrupt two-part vocalization.



Displays are fragments of behavior that may be combined in various ways, and may shade gradually into an entirely different display.

Displays may have a range of fairly specific referential content.

E.g., **warning calls**



snake warning call: stand up on hind legs in the open & look around on the ground

leopard warning call: run up to the top of the nearest tree

eagle warning call: run into a nearby bush or under the lower branches of a nearby tree.

There is some evidence that vervets show **skepticism toward unreliable members of the group**, and pay less attention to their warnings; and also that the calls can be used **deceptively**. But for the most part, the calls seem to be an **automatic reflex**.

Instinctive vs. learned patterns

Vervet monkeys - the same set of warning cries.

The particular creatures that evoke them vary,
depending on the local types of predators.

Baby vervets - indiscriminating,

"eagle" calls to any large bird,

"leopard" to any largish terrestrial animal, including grazing animals,
anteaters etc.

Gradually learn -- apparently from the reactions of their elders -- how not to
"cry wolf."

Most animals learn to

respond appropriately to the warning cries of other species
that happen to live near.

=> ability to understand these communications is not innate.

Primate language instruction

Have **certain apes** been taught "language" ?



Apes were able to **associate meanings** with the various symbols.

What about combining the items in new ways? - a hallmark of human language.

The chimp Lana uttered this when presented with an orange, for which she had not yet learned a symbol:

apple which-is orange-color

Appropriate **extension** of *apple* to cover other fruit, as children do?

But look at the entire **context** (in which the trainer Tim is holding an orange):

Tim	What color of this ?
Lana	Color of this orange
Tim	Yes
Lana	Tim give cup which-is red
Tim	Yes
Lana	Tim give which-is shut ? Shelley give ?
Tim	No Shelley
Lana	Eye Tim give which-is orange?
Tim	What which-is orange
Lana	Tim give apple which-is green ?
Tim	No apple which-is green
Lana	Tim give apple which-is orange ?
Tim	Yes

The seeming novel combination occurs in a sequence of rather **fixed expressions**

in a pattern which may have been learned by rote,
plus others that don't make much sense.

It wasn't Lana who introduced the notion of color here, it was Tim the trainer who did.

Confusion: misunderstanding among non-signers of what sign-language is.

It is **not** a pantomime of iconic gestures and pointing, but a full-fledged language made up of **arbitrary** symbols.

A damning critique of the claims of the early primate sign language researchers comes from a deaf native ASL speaker on the team working with Washoe:

Every time the chimp made a sign, we were supposed to write it down in the log ... they were always complaining because my log didn't show enough signs. All the hearing people turned in logs with long lists of signs. They always saw more signs than I did ... I watched really carefully. This chimp's hands were moving constantly. Maybe I missed something, but I don't think so. **I just wasn't seeing any signs. The hearing people were logging every movement the chimp made as a sign.** Every time the chimp put his finger in his mouth, they'd say "Oh, he's making the sign for *drink*," and they'd give him some milk ... When the chimp scratched itself, they'd record it as the sign for *scratch* ... When [the chimps] want something, they reach. Sometimes [the trainers would] say, "Oh, amazing, look at that, it's exactly like the ASL sign for give!" It wasn't.

Multiple layers of intentions and beliefs:

Thus for "she means P" to be appropriate,
someone has to use that sentence with

the intention of making an audience believe that she believes P, and also
with

the intention of making them believe that she used the sentence with the
intention of making them believe that she believes P,

& with any number of even more complex conditions on various parties'
beliefs and intentions.

Or even:

just to use pronoun “she”, someone has to know there’s a salient female

and also to know that the hearer knows about this salient female

and also to know that the hearer is aware that the speaker knows this,

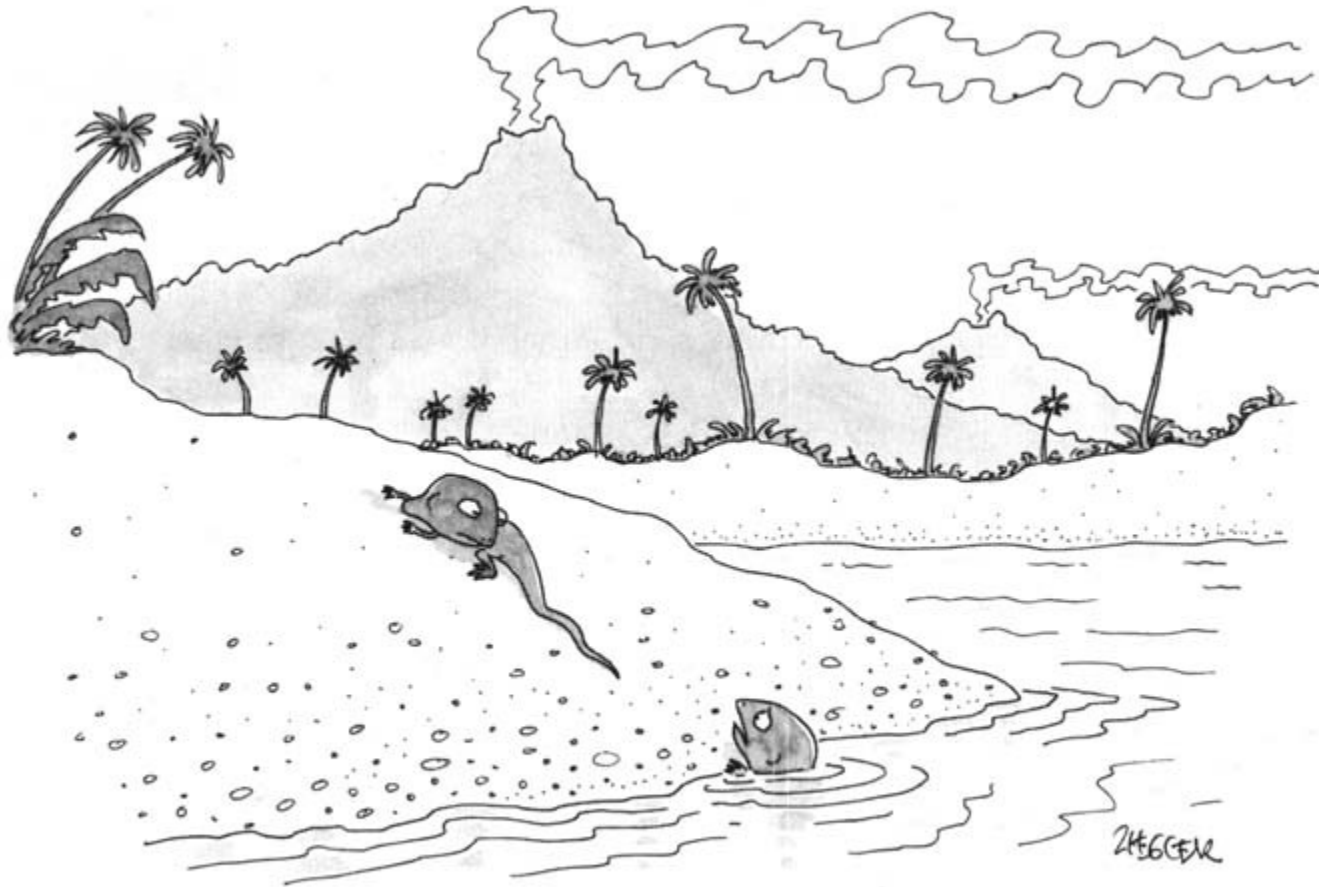
....etc.

Cheney and Seyfarth on "attribution" in monkey and ape communication:

The moment that an individual becomes capable of recognizing that her companions have beliefs, and that these beliefs may be different from her own, she becomes capable of immensely more flexible and adaptive behavior. [. . .]

Most of the controversy surrounding animal communication. . . centers on ... whether animals are capable of acting as if they want others to believe that they know or believe something. . . ability to represent simultaneously two different states of mind. To do this an individual must recognize that he has knowledge, that others have knowledge, and that there can be a discrepancy between his own knowledge and theirs.

The evolution of human language



"If Mom catches us out here, we're really gonna get it!"

Some earlier ideas

The Bow-Wow theory - onomatopoeic words for e.g. animal calls.

The Pooh-Pooh theory - reflexive sounds used to express human emotions

The Ding-Dong theory - natural connections between sound and meaning (similar to the bow-wow theory)

The Yo-Heave-Ho theory - words based on grunts and groans of exertion, as in rhythmic chants that helped people work together.

Etc.

Darwin was associated with, for example, the Pooh-Pooh theory:

[Anyone] fully convinced, as I am, that man is descended from some lower animal, is almost forced to believe a priori that articulate language has developed from **inarticulate cries**.

Oxford philologist **Max Müller**,



following Descartes' view of
the essential difference
between humans and animals



(and sometimes said to be
a proponent of the Ding-Dong theory)

declared language to be "**the Rubicon that no brute will dare to cross.**"

1876

Linguistic Society of Paris **bans** all presentations on language evolution.

Relatively little interest in language evolution (next 110 years):

- Cartesian uneasiness about trespassing on the domain of the mind.
- Lockean uneasiness about a specific biological substrate for language learning.
- Unusual difficulty of investigation due to apparent discontinuities between animal and human communication.

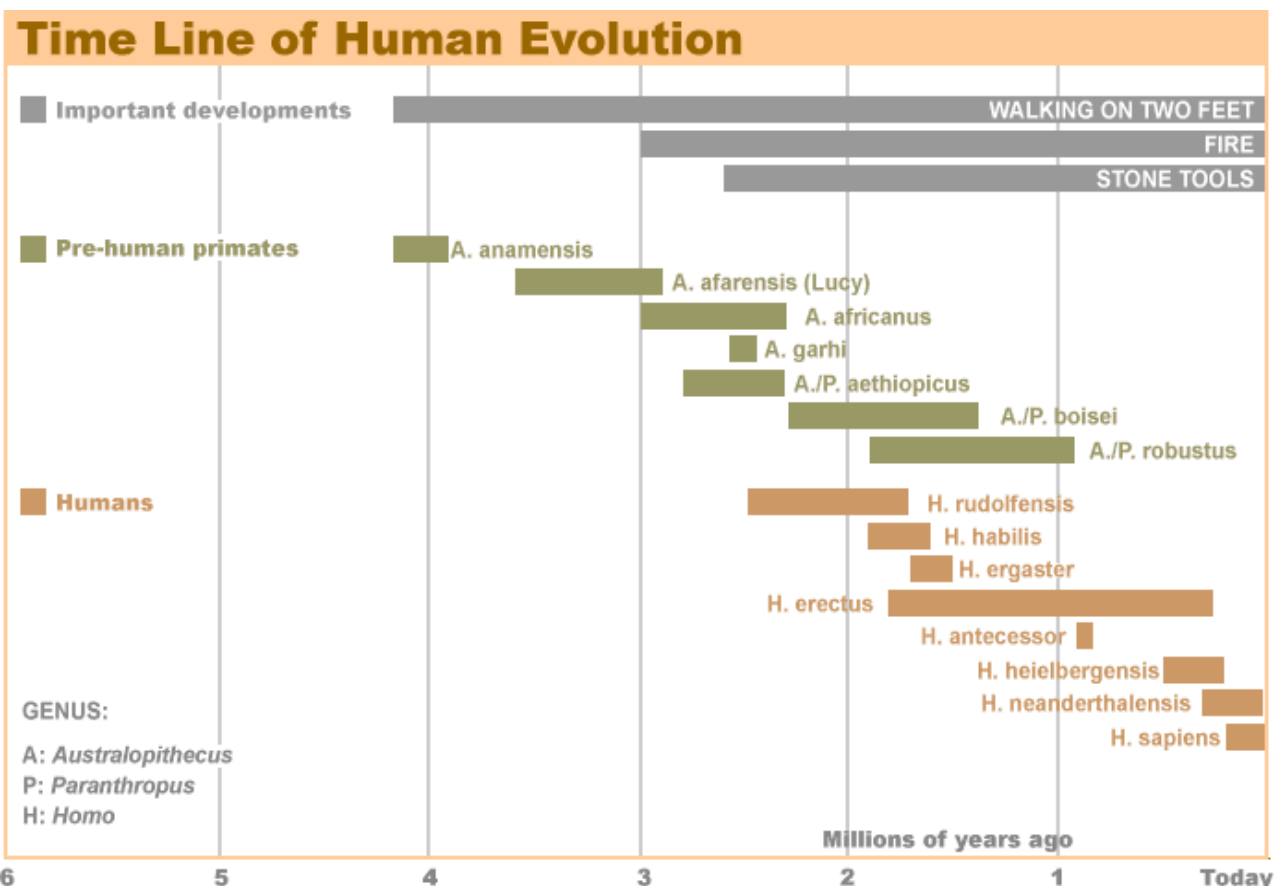


Meanwhile, **background scientific understanding** was developing:

- general hominid paleontology
- the functioning of the larynx
- (paleo-)neurology
- ethology and the role of vocal displays: bird song, whale song
- studies of primate behavior, social organization, vocal signaling
- evolutionary theory

With the advent of **evolutionary psychology**,
a renewed interest in the origins of language.

Is language in our genes? - **genetic evolution of language?**



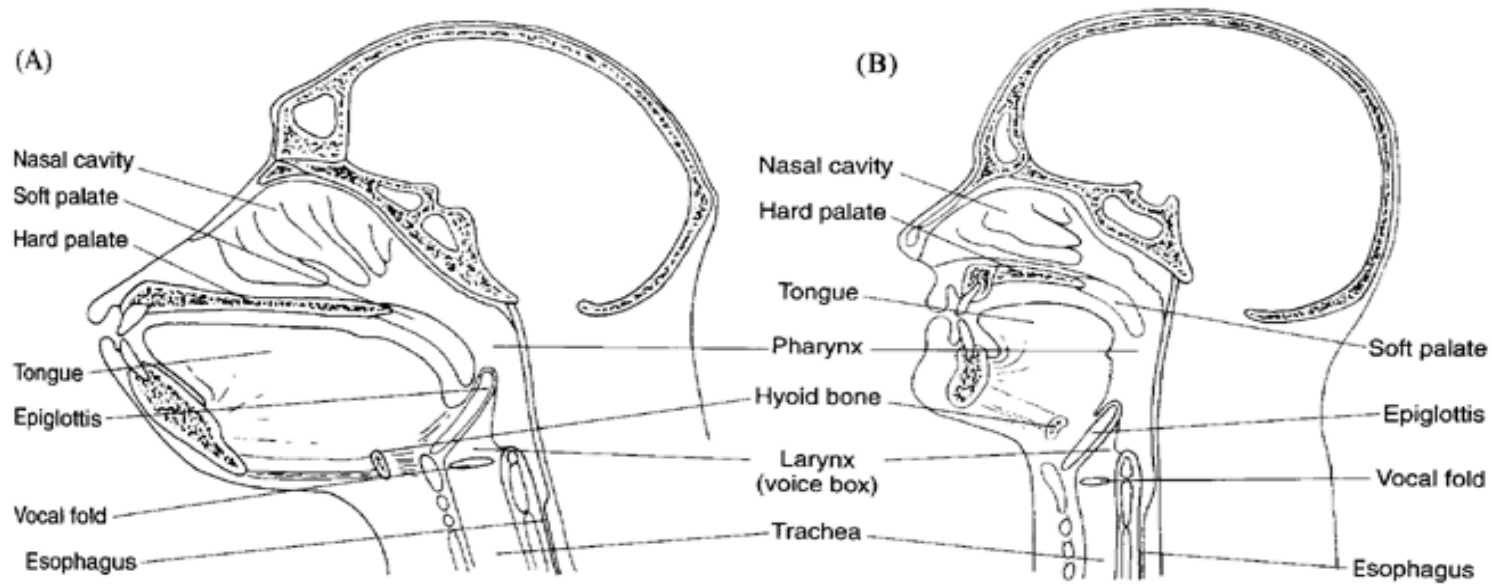
Human ancestry

Roughly five million years since we separated from the ancestors of today's great apes (chimpanzee, gorilla, etc.).

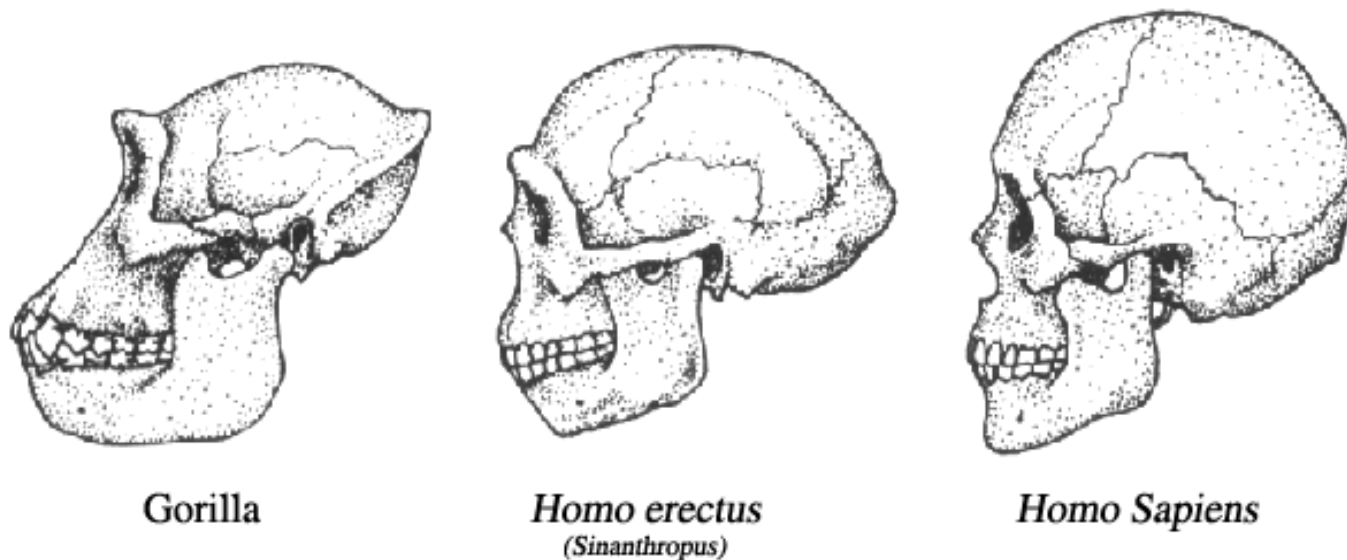
*General overview of this long period of **hominid evolution**.*

Vocal tract changes in hominid evolution

chimpanzee and human vocal-tract anatomy:



The skull of *Homo erectus*, 1.8 million & 100,000 years ago - **intermediate**



Holloway 1996, *The evolution of the human vocal apparatus*:

The lower position of the larynx alters dramatically the way humans... breathe and swallow.

The loss of the ability of the epiglottis to make contact with the soft palate means that the possibility of having two largely separate pathways, one for air and one for liquid, no longer exists.

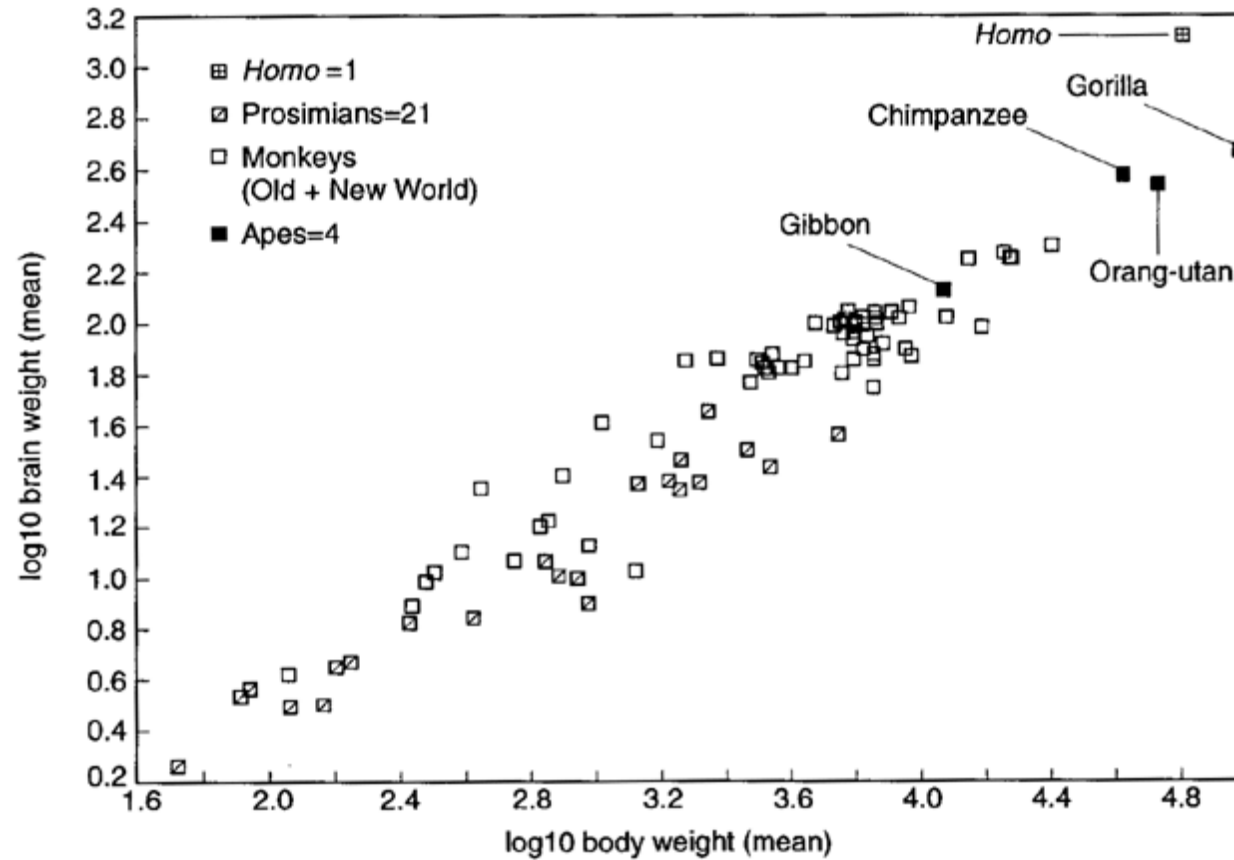
The respiratory and digestive tracts now cross each other...

This new configuration... does have unfortunate drawbacks.

The major problem is that... food can become lodged in the entrance of the larynx. If this material cannot be expelled rapidly an individual may literally choke to death...

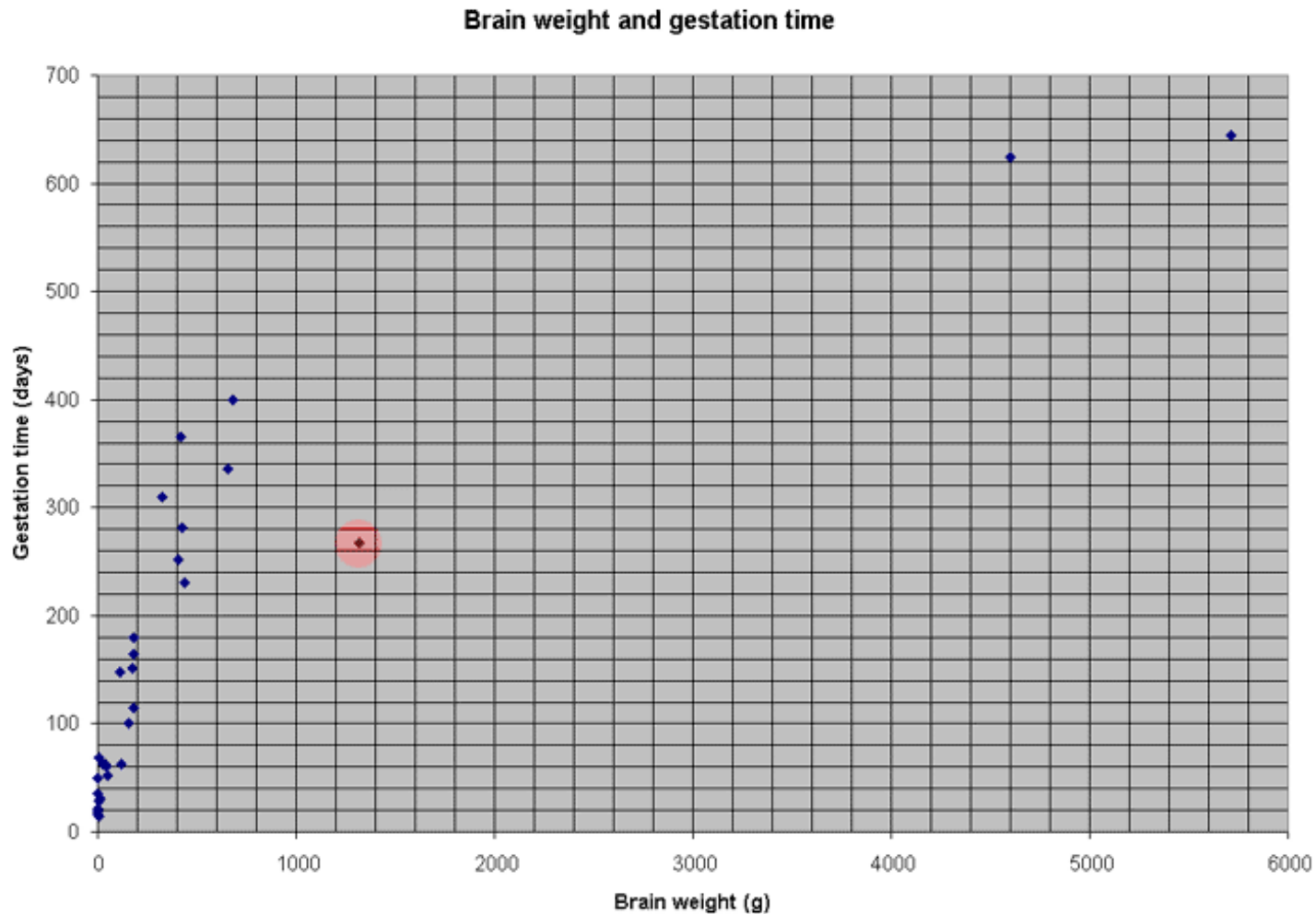
Brain changes

One thing that happened to our brain was that it just **got bigger**.



Increased brain size normally translates to **increased gestation period**

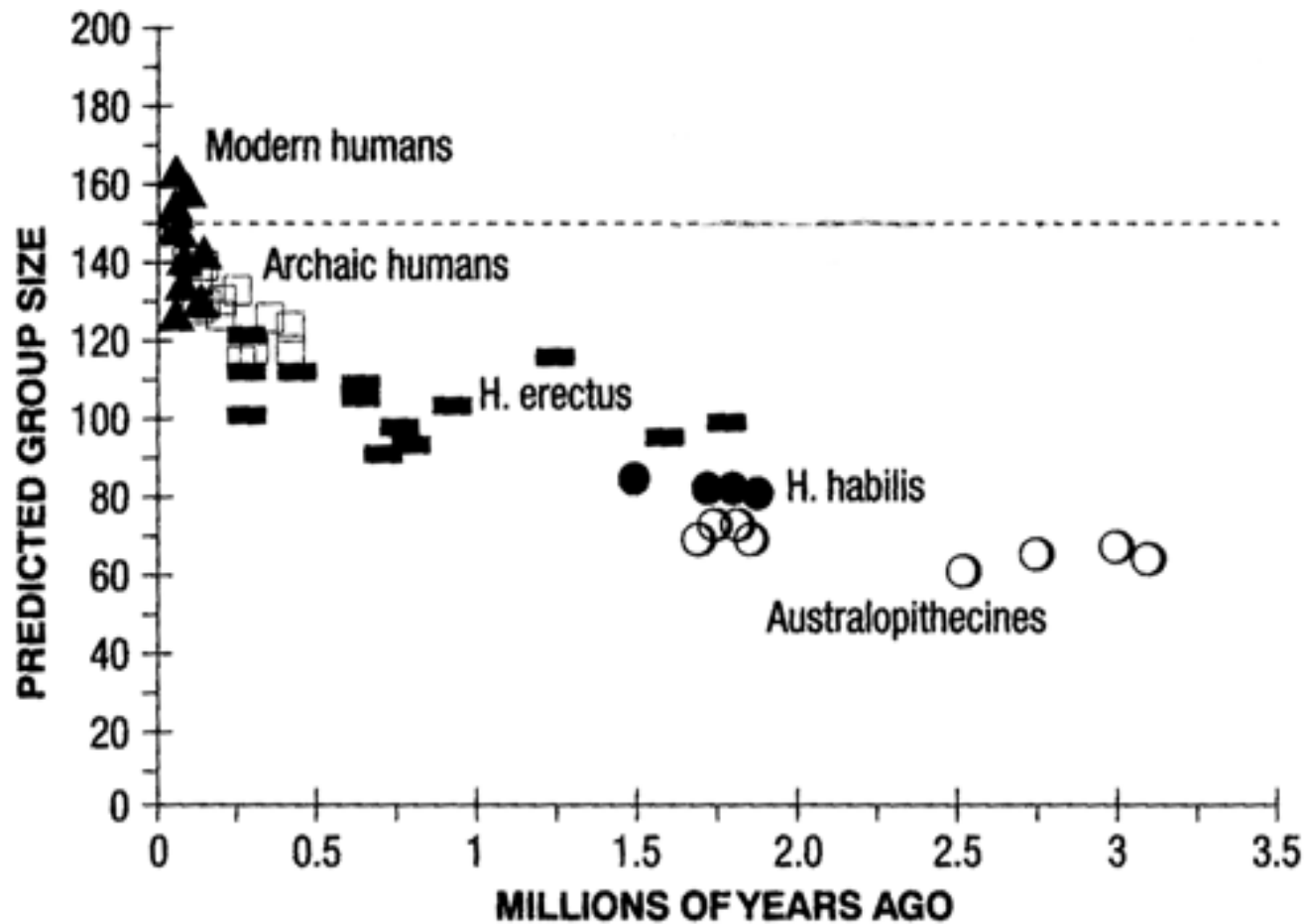
The relationship for a dozen species from mice to elephants:



Human babies ought to be born about 17 months after conception, rather than 9.

Gossip and grooming

Relationship between brain size and social group size in other primates:

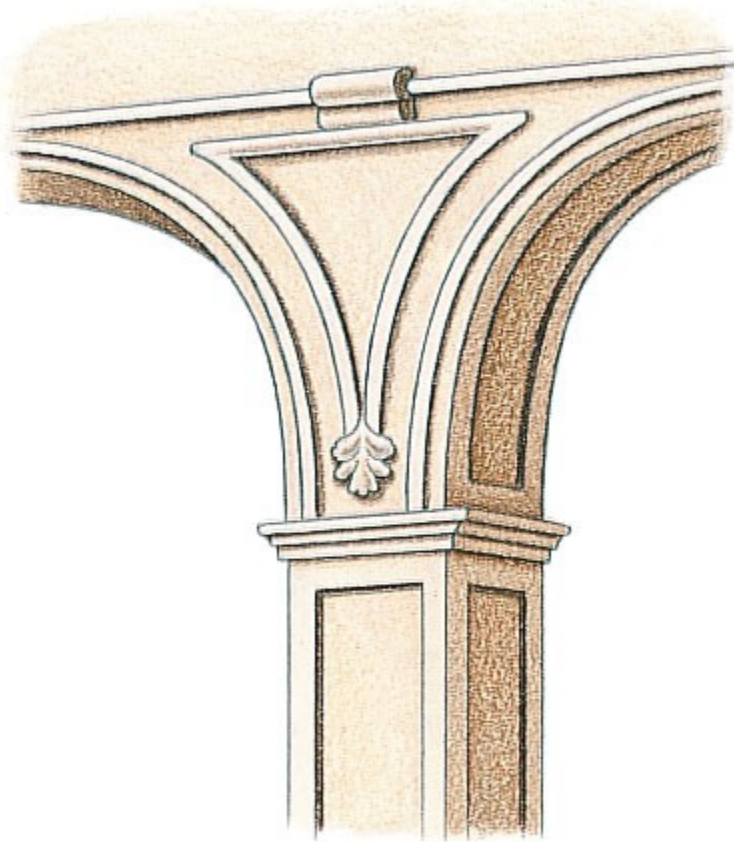


Grooming is a major factor in establishing and maintaining social bonds.

Bigger group => more time spent in grooming others.

Group size of 150 => 40% of the day spent in grooming.

"Spandrel" theories



Language as a sort of **accidental side-effect** of larger brains

Stephen Jay Gould has called this **evolutionary spandrels**.