

The evolution of human behaviour



These rock carvings are part of an archaeological site near the town of Alta in Finnmark, Norway. The earliest carvings in the area date to around 4200 BC, the most recent carvings are generally dated to around 500 BC.

How did our culture evolve?

Humans share 95–99% of DNA sequences with chimpanzees, our closest living relative. Yet there are obviously huge differences in behaviour, including our capacity for remarkable technological advances, our development of social institutions and our use of language and social norms. The result is our unparalleled construction of tools (for example for hunting, farming, communication, transportation and medical treatments), unique social groupings (tribes and nation states with their own laws and customs), and social institutions (schools, hospitals, governments and markets). So how did humans develop such a unique and complex culture?

Facts

The only human species that lives today is *Homo sapiens sapiens*, but in the past different human species co-existed.

For humans to evolve large brains, infants' brains continue growing at foetal rates after birth. Otherwise it would be impossible for their heads to pass through the birth canal.

Homo habilis means 'handy man'.

H. erectus made bi-face (double sided) tools, first found in St. Acheul, France, included teardrop-shaped hand axes for butchering large animals or for symbolic display as objects of prestige.

Neanderthals were a strongly built hominid species first found in the Neander Valley (or 'Tal'), Germany. They hunted large game with tools. Their extinction 30,000 years ago was perhaps due to temperature fluctuations, change in natural resources or competition from our ancestors.

A brief history of humans

We start in the Miocene period, 23–6 million years ago, when the earth cooled and the African tropical forests retreated, leaving tropical grasslands (or savannahs) and a seasonal climate (wet and dry). The human lineage diverged from that of chimpanzees about 5 million years ago and was accompanied by a transition from arboreal life in trees to terrestrial life on the savannah. This favoured the evolution of bipedal locomotion (walking on two legs), freeing up the hands for communicating through gestures, food transport and tool manufacture.

Compared to modern humans, *Homo habilis*, the first human species (2.4–1.5 million years ago), was small and – like chimpanzees – exhibited division of labour between the sexes and food sharing. However, *H. habilis* was the first to craft stone tools. Tools enabled increased meat consumption and fuelled the large, energy-expensive brain of early *Homo*.

With further increase in brain size, *Homo erectus* (1.8–0.4 million years ago) evolved as a hunter-gatherer, living in large family groups or bands that invented 'biface' (double-sided) tools, hunted in large groups, probably used fire and migrated out of Africa.

Modern humans (*Homo sapiens*, 200,000 years ago) migrated out of Africa 70,000 years ago, replacing *H. erectus* and Neanderthals. Archaeology shows a behavioural revolution 40,000–35,000 years ago (Upper Palaeolithic period), including elaborate tool kits and shelters, long-distance transport of materials, art, rituals and symbolic expression.

Another major change occurred 10,000–2,000 years ago (Neolithic period), when modern humans began farming, resulting in permanent human settlements, increasing trade, large-scale co-operation, and the inheritance of wealth.

Activities

Split half the class into 'founder' groups of four individuals. Each group is on a separate table. Each individual builds their own spaghetti tower out of raw spaghetti and plasticine and can observe others at their table, while the remainder of the class ('non-founders') are given a distracting activity away from the tower-building tables. Every 3 minutes, an individual from each tower-building group is replaced with a non-founder, who builds their own tower and can observe others at their table.

Do non-founders, who join the group later, make taller towers, representing cumulative cultural evolution? Are towers more similar within groups than between groups, representing group norms?

For method, see: Caldwell CA & Millen A. 2008. *Evolution and Human Behaviour*, 29: 165–171.

Play the 'Ultimatum Game' using tokens to examine fairness and punishment. For details, see: <http://money.howstuffworks.com/ultimatum-game.htm>

What makes humans special?

There is lots of debate among researchers about which mental (or cognitive) abilities separate humans from chimpanzees. Here are some of the strongest candidates:

- **Technical intelligence and cumulative cultural evolution** – the capacity to invent and improve technology (eg tools for foraging) through cumulative cultural evolution. The amount of knowledge 'ratchets up' over generations (eg abacus to computer), as people pass on knowledge through social learning (eg imitation) and modify it through individual learning. Chimpanzees use tools and can imitate, but show little evidence of cumulative culture.
- **Social intelligence** – keeping track of others' behaviour to enhance status and reproductive success (eg deceptive behaviour). This requires 'theory of mind', whereby you understand what someone else is thinking (eg 'I know that you know/think/believe/desire/fear something'). Chimpanzees can understand others' goals (eg following gaze direction), but cannot understand others' mental states.
- **Co-operation and prosocial behaviour** – co-operative behaviours, such as harvesting, hunting or warfare, can be advantageous if others in your group co-operate too. The benefits of co-operative behaviour may have favoured the evolution of prosocial emotions, such as a sense of justice, pride, guilt and honour, and also strong reciprocity – a willingness to co-operate and to punish others who do not co-operate, at a cost to yourself. Chimpanzees are neither altruistic (they do not help others), nor do they punish those who do not co-operate.
- **Language and symbolism** – human language allows the communication of functional information about the past or future and uses grammar, enabling a limited number of words to express infinite meanings. Language is important for transmitting information accurately, for example by teaching. Chimpanzees use gestures and simple vocal signals without grammar or teaching.

Questions

How do you think technical intelligence, social intelligence, prosocial behaviour and language influenced human history?

Have humans stopped evolving? If so, when?

Can genetic and cultural evolution affect one another?

How might human migration and modifying our environment have influenced human evolution?



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Web links

Animal 'culture wars'

www.thepsychologist.org.uk/archive/archive_home.cfm/volumeID_21-editionID_159...1333.../thepsychologist%5C0408kend.pdf

Children don't develop theory of mind until about age 3

www.youtube.com/watch?v=MapnGqrY_jw

Chimpanzees using tools

www.youtube.com/watch?v=Eglql2X-mj8

Economics games to show strong reciprocity in humans

www.psych.ubc.ca/%7Ehenrich/Website/Papers/Science/commentaryHenrichetal2006Science.pdf

Take part in language evolution experiments

www.language-experiments.org

How human culture evolved – still one of the great mysteries

www.livescience.com/strangenews/070809_gm_humanculture.html

Make a biface stone blade

www.youtube.com/watch?v=3ml0dS-vyz8

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Over 50% of scientists and engineers responding to a survey conducted by the Royal Society felt that schools were a key audience for their research. They believed that communicating research findings to this audience was an important way of making sure that the general public is well informed about science and technology. On that basis, the Triple Science Support Programme and the UK Research Councils have collaborated to publish Quick Guides on a range of extension topics in physics, chemistry and biology (Triple Science GCSEs). The guides are written specifically for teachers by researchers working in the field. For more information about the Triple Science Support Programme and to download all the Quick Guides please go to www.triplescience.org.uk