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# Of rattles and puzzle boxes — social learning as the key to being human

Learning is great! It enables us to continuously develop and to create something new on this basis. Fortunately, not everyone has to reinvent the wheel. Instead, we build on the knowledge of our ancestors, constantly expand it, and collect it in encyclopedias or on online sites.

We all started small when we embarked on our learning expedition. It had already begun in the womb. An example: if fetuses are told a story repeatedly in the last month of pregnancy, they seem to remember it later. They will react to it specifically after they are born when they hear this story again. By the time we read this text, we have already left this early stage of development behind us and can no longer remember what it was like to see the light of day for the very first time. We can only imagine how exciting, loud, and perhaps also overwhelming it must have been to experience our world for the first time with all our senses. It is impressive how well newborn babies find their bearings. This raises the exciting question of how babies know which of the many pieces of information they are bombarded with is important and which they can simply ignore. Research in developmental psychology over the past few decades has a possible answer to this: the little ones follow the example set by their fellow human beings.

Newborn children find faces and biological movement, i.e., movement patterns that originate from living beings, particularly exciting. They are very good at recognizing other people's viewing direction and notice early on when they are being looked at. Where people look is an indication of what the person is paying attention to. For example, if a person keeps turning away from us during a conversation and looks to the side, we usually follow their viewing direction to find out what is so captivating.

**1** A curious child.

**2** The baby sits intently in front of the eye tracker, a special device that recognizes exactly where on the screen the child is looking.

Infants show similar behavior. They not only look to see what other people are looking at but also use other people's viewing direction to learn: A series of studies have shown that infants as early as four months can better process and recognize objects that another person is also looking at. How do we know? After all, we cannot ask the child. One way is to examine where children tend to look. You can film children and later evaluate the video accordingly. But there are also devices, so-called eye trackers, which provide computer-based information about what a person is looking at.

In a series of studies, babies observed one person looking at a toy, such as a ball, and actively not looking at another toy, such as a rattle. The two toys were then shown again. On average, the babies looked longer at the toy that was not looked at by the person beforehand, i.e., the rattle in our example. What does this result imply? Infants prefer new things: they look longer at things that are new and therefore exciting for them. When babies see that another person is looking at the ball, the child's attention is drawn to it and the memory of the ball is stored. If the child sees the ball a second time, it is already familiar and therefore less interesting. The other toy, the rattle, is still unknown when it is

*Fig. 2*

presented again and is therefore looked at for a longer time. From these results, researchers conclude that other people's viewing direction draws the babies' attention and helps them focus on important things in their environment.

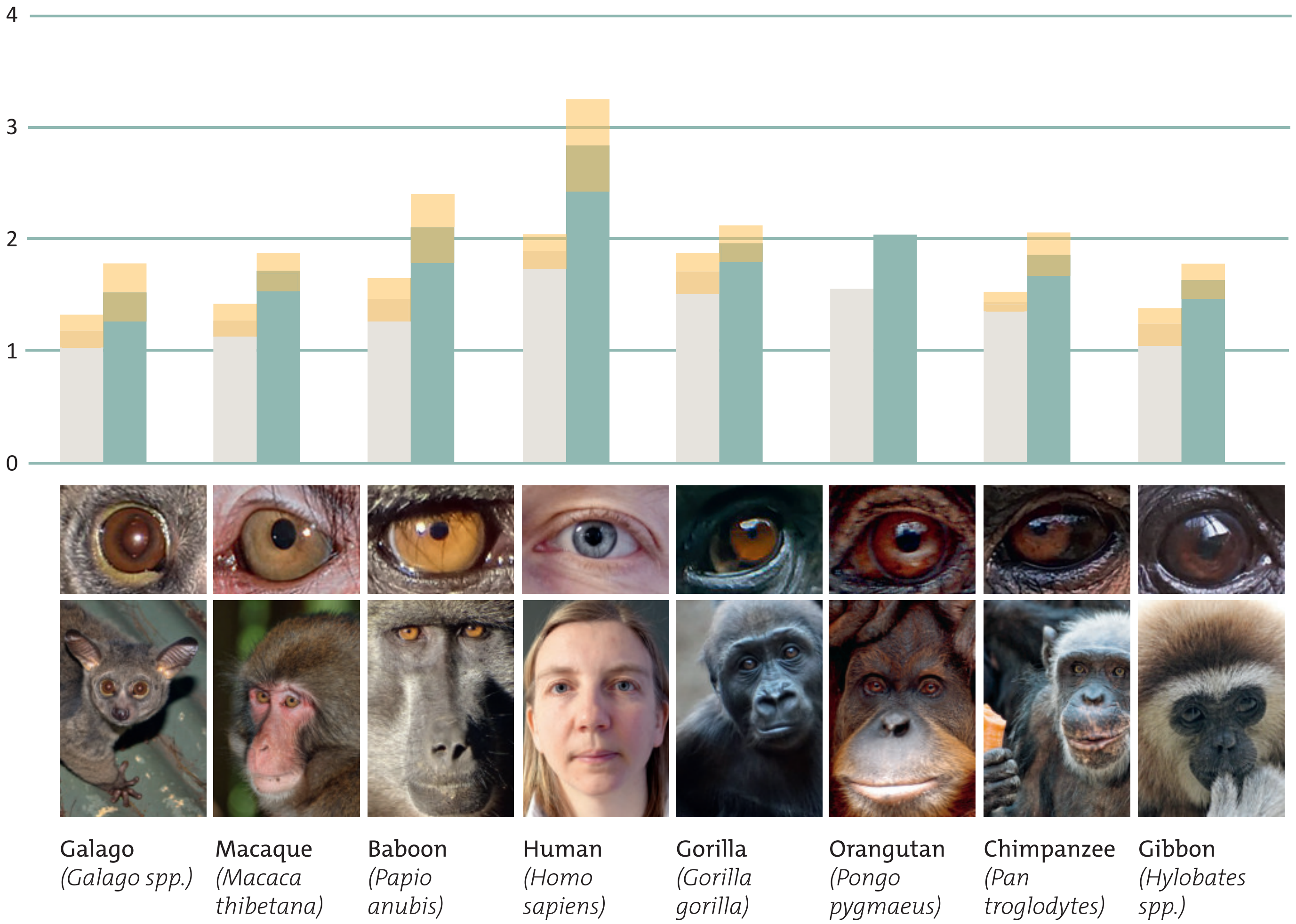
But is that typically human behavior? We do not really know yet, but the assumption is that humans can draw a comparatively large amount of information from other people's viewing direction. Why is that? Compared to the eyes of other species, human eyes exhibit a particularly large contrast between the black pupil and the white background sclera. *Fig. 3*

Could the typical human black and white contrast of the eyes help babies see what other people consider important? To find out, researchers showed different videos to four-month-old babies. In one video, the babies saw black dots that moved to the side on a white background, just like eyes that look to the side. The eyes "looked" in the direction of one toy and away from another. When the two toys were presented again, the babies—just as in the previous studies—looked longer at the toy from which the eyes had previously turned away. It seems that black dots on a white background have the same effect as a person's viewing direction: they draw the children's attention to things in the environment and the children learn something about them in a targeted manner. Later these things are more familiar and therefore less interesting and are only briefly looked at. *Fig. 4*

In another experiment, the children saw the same video, only this time the contrast was reversed: white dots were moving on a black background. Now the "eye movement" did not have such a clear influence on how long the children looked at the two objects. That is, white dots on a black background guided the babies' attention less than black dots on a white background. These types of studies show us that others can steer the babies' attention. The eyes seem to play a key role.

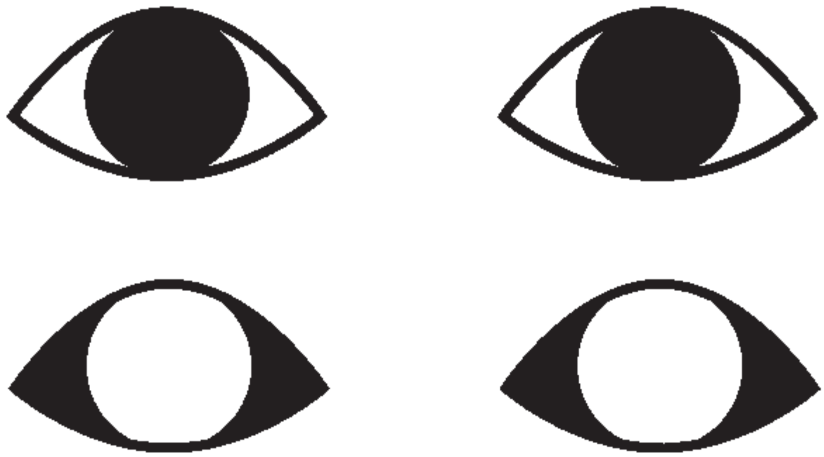
Social learning, that is, learning from other people, is far more multifaceted. The older children get, the greater their scope for action and their motor skills. Children can now carry out complex actions in a targeted manner. A crucial ability is to observe others and to carry out seen actions oneself, i.e., to copy behavior. Puzzle boxes are often used in research to investigate the development of this observational learning.

You can perform various actions on such puzzle boxes, for example, pushing a lever, inserting a stick, or knocking on it. Most of these boxes contain a reward. In studies on observational learning, children are shown what to do to get the reward out of the box (for example, by sticking a stick in an opening). Then the children are allowed to try to solve the box themselves. Here it is examined whether the children achieve the goal and whether they imitate the actions that are necessary for it, that is, whether they have learned through observation. *Fig. 5*




**3** Comparison of the eyes of different species. The strong black and white contrast in human eyes, which helps people recognize in which direction their counterpart is looking, is especially striking.

In research, a distinction is made between two imitation strategies: so-called emulation and imitation. In emulation, a person learns something about the goal that can be achieved through observation. In our example, this means that you can get the reward out of the puzzle box. It is not important how exactly or by which means you get the reward. It is important that the reward can be taken out of the box. The learners could just as easily break the box, tip it over, or use another tool. Emulation processes, therefore, concentrate on the goal of an action, not on the way to get there. In contrast, in imitation, the journey is the goal. Here a person learns through observation how exactly an action must be

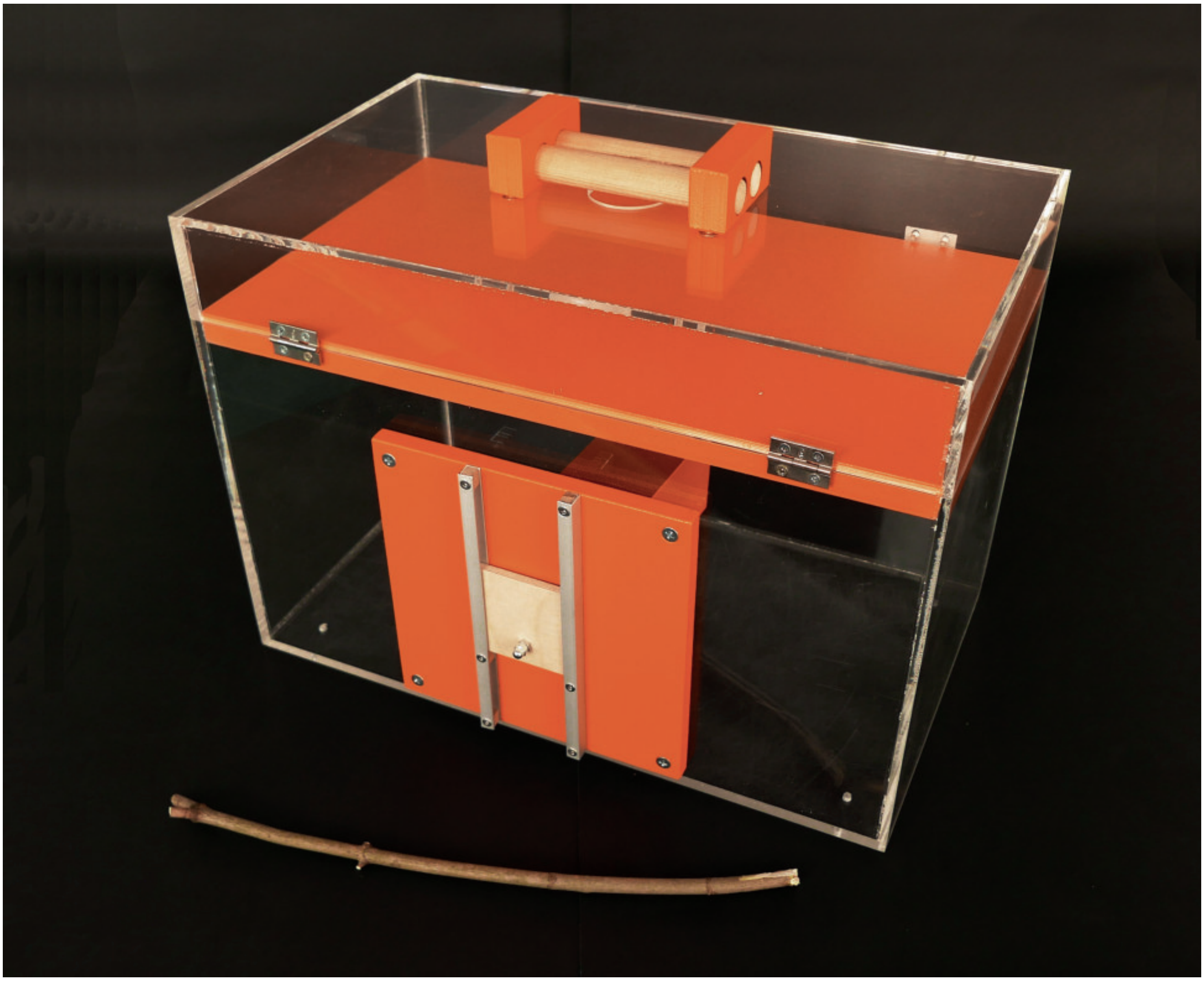


**4** Illustration of the “eyes” that the babies saw in the study. Above, the eyes with natural black and white contrast. Below, the changed contrast with white dots on a black background.

carried out to achieve a goal. In the case of imitation, the learners would insert the stick in the same opening to receive the reward. With imitation, behavior is copied, with emulation the focus lies on the goal.

Do humans differ from other species in their imitation or emulation behavior? This question was investigated in a study with circa four-year-old children and chimpanzees. The study consisted of two different tasks: in one task, children and chimpanzees saw an opaque puzzle box with a reward inside. For the children, it was a sticker and for the chimpanzees, it was a treat. The investigators demonstrated different actions that could be done on the box. Some led to the goal: if you inserted the stick into the lower opening of the box, you could reach the reward. Another action, however, was pointless: if you inserted the stick into the upper opening, you could not reach the reward. Since the box was opaque, it was not clear why only the lower and not the upper opening led to the prize. The same procedure was also demonstrated using a transparent box. Here the observers saw that a built-in plate in the upper opening prevented them from reaching the reward. The mechanism of the puzzle box was obvious. Now it was time for the observers to try. Would children and chimpanzees imitate (that is, also copy the unnecessary actions and insert the stick in the upper opening) or emulate (that is, achieve the goal by only inserting the stick in the lower opening)?

Children imitated the actions on both puzzle boxes, that is, they also imitated the useless actions, regardless of whether they could see the mechanism in the box or not. Chimpanzees, on the other hand, only imitated the unnecessary actions if the box was opaque and they could not see the blocking plate. If the mechanism for releasing the prize was clear, they emulated and took the reward out of the lower opening. But why did the children imitate unnecessary actions and chimpanzees not? What does this result tell us about differences in social learning between the human and chimpanzee species?



**5** Example of a puzzle box as it is used in the studies on observational learning.

Current research discusses a variety of explanations for why children mimic unnecessary actions. For example, social norms could be seen as a reason to imitate something that does not make sense ("That's the way it is done!"). It is also possible to assume that the person who demonstrated the senseless action has a specific intention ("There's got to be a good reason why he or she does something so strange. I should do it!"). Or, children want to belong, and imitation, i.e., doing it exactly the same way, could promote a feeling of belonging ("If I do it exactly as they did, then I belong!"). In the course of evolution, humans began to live together in growing groups, and cooperation and collaboration became more important. We can therefore assume that it is particularly important for humans to give a good impression and to be part of the group, as this makes it easier for us to find partners with whose help our coexistence and survival becomes easier. In the case of chimpanzees, this aspect could be less pronounced, so that they concentrated more on achieving the goal than on social processes—and therefore emulate. Some researchers believe that chimpanzees are not able to learn via imitation.

In social learning, children seem to place great emphasis on social norms, affiliations, and intentions. This is supported by another finding: children let others dissuade them from their strategy when solving a puzzle box. If they observe their peers, they often tend to adopt their strategies. Great apes, on the other hand, do not care when another ape has found a new solution strategy for the puzzle box—they tend to stick to their own strategy. In their behavior, children are much more influenced by other children than great apes are influenced by other great apes.

There is a lively debate in science about why and under what circumstances humans and other species imitate unnecessary actions—and thus also under what circumstances they can best learn from like-minded people. It is believed that imitation and learning about useless actions are important for us as a human species to be able to pass on cultural knowledge. Cultural knowledge includes, for example, ritual processes or customs that have no obvious physical function but are of great importance within a culture. Pure emulation (reaching the goal) could make this information more difficult to pass on to the next generation or even lead to it getting lost.

Whether it's rattles or puzzle boxes: the field of social learning is broad and with the help of developmental psychological studies we are getting a little closer to solving the riddle of what it means to be human. At the same time, however, we are still a long way from understanding everything. This is what makes learning about ourselves as a human species so exciting!

## Further reading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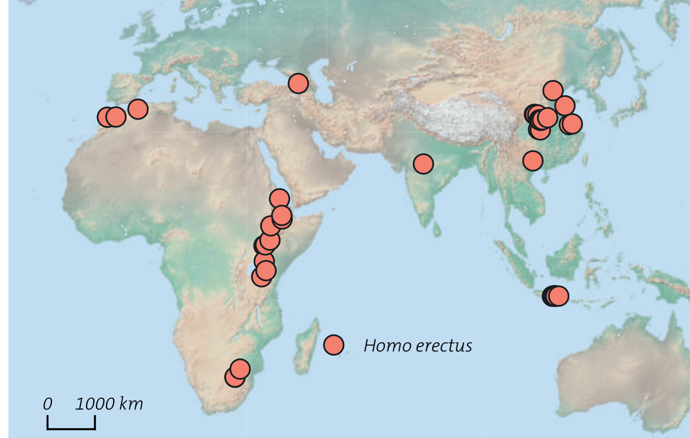
# *Homo erectus*

Profile




**Discovery**

The first remain of a *Homo erectus*, a cranium, was discovered in 1891 by Eugène Dubois in Trinil on the island of Java, Indonesia.

**Sites**

Indonesia: Sangiran, Sambungmacan, Trinil, Ngandong, Kedung Brubus, Mojokerto.

Georgia: Dmanisi.

South Africa: Saldanha.

Tunisia: Ternifine.

Further sites in: Kenya, Tanzania, Ethiopia, Morocco.

**Finds**

Skull fragments, teeth, lower jaw bones, various arm and leg bones.

**Age**

1.9 million–110,000 years.

**Brain size**

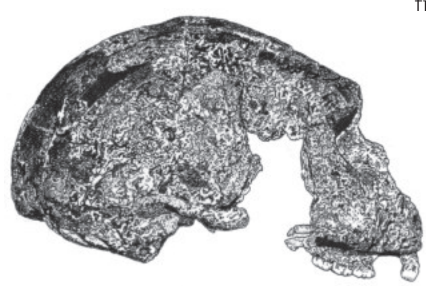
circa 870–1.150 cm³.

**Characteristics**

In general, *Homo erectus* is considered to be the first species of the genus *Homo* to leave the African continent. However, since the remains from different regions differ greatly, it is not certain whether the finds from Africa and Europe are actually the same species as those of the Asian *Homo erectus*. *Homo erectus* were bipedal, just like modern humans today. Their size ranged from 1.45 to 1.80 m and they weighed between 50 to 60 kg. Their diet was presumably very variable and consisted of both plant and animal food. With the help of a particularly well-preserved skull, researchers found that *Homo erectus* already had cartilaginous noses, similar to those of modern humans, which led to improved thermoregulation of the breathable air and thus supported stamina and a more active lifestyle. In addition, they had a flexible thumb, which gave them fine motor skills. Skeletons of *Homo erectus* are very similar to those of modern humans and differ mainly in their stronger bone density and slightly elongated skulls with strong brow ridges above the eyes.

Facial reconstruction

Skull calvaria OH9
from Olduvai, Tanzania



Skull
Sangiran 17, Indonesia

Skull D2700
from Dmanisi, Georgia