

# Subordinate animals as guinea pigs

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A group of meerkat is crossing the road - subordinate individuals have to take the lead. Credit: Simon Townsend/Kalahari Meerkat Project

Subordinate animals must face higher risks than dominant ones. Dominant meerkat females yield to their subaltern group members when faced with a dangerous obstacle: as a group of these animals reaches a road, a "guinea pig" has to go first. This is the result of a behavioural study conducted by researchers from the University of Zurich and ETH Zurich.

In their environment, wild [animals](#) are exposed to countless threats, be they predators, diseases or natural obstacles to get over, such as gorges or rivers. In the course of evolution, they have developed specific behavioural responses to allow them to deal with these risks. In recent times, numerous man-made threats have been added to the naturally-existing ones, such as dangerous roads to cross. On the evolutionary time scale, it is excluded that the animals have evolved a whole new repertoire of adaptive responses to these risks. Simon Townsend is a behavioural biologist at the University of Zurich, and Nicolas Perony is a systems scientist at ETH Zurich. They teamed up to understand how animals cope with novel man-made threats by studying groups of wild meerkats, a species of socially-living mongooses.

## The leader gives way when crossing the road

To this end, Townsend observed several meerkat groups in the [Kalahari Desert](#). Through the reserve runs a rather heavily-frequented road, which effectively cut the animals' home range in half. On their way from one burrow to another, the meerkats are often forced to cross the road. Based on field observations, the researchers discovered that in most cases it was the highest-ranked animal—the dominant female—who led her group to the road. However, upon reaching the road she yielded to a lower-ranked individual, who took up the role of "[guinea pig](#)" to cross the road first.

## Reorganisation at the front

From the observational data collected in the Kalahari, Nicolas Perony could develop a relatively simple computer model to simulate for the first time the behaviour of a meerkat group, in which there are distinct social roles. By constructing this model, the researchers were aiming to better understand what they had observed in the field. The model simulates a group of eight meerkats, one of which Perony assigned the role of leader.

In the simulations the eight agents encounter a virtual barrier, which has an effect similar to the road's. The scientists could then vary the height of the barrier—the level of the risk it represents—for each individual. The model clearly showed the reorganisation taking place at the front of the group. The ETH researcher thus concluded that the dominant female and the subordinate individuals have a markedly different appreciation of the danger presented by the road. This difference in risk perception may be enough to explain how the leading individual falls back to a less exposed position upon reaching the road, and leaves it to a subordinate individual to take the lead.

## A 'test individual' to minimise the risk

The dominant female's highly risk-averse behaviour appears selfish. However, it makes a lot of sense for the long-term survival of the group and the closely-related individuals in it. Meerkats in fact

minimise the threat to the whole group, even though it may imply for the "test individual" to lose its life: the survival of all the group members may depend from that of the alpha individual. Observations from other researchers indeed show that the predation of the dominant female can lead to the destabilisation of the whole group.

Provided by ETH Zurich

Perony and Townsend interpret the observed behaviour at the road as the adaptation of a phylogenetically-old behavioural response, transposed to the context of a danger hitherto unknown to them. The animals can thus apply innate behavioural mechanisms to a novel, man-made threat. It is however unclear whether the meerkats really perceive the traffic on the road as a risk. A road is above all an open area in the animals' environment, in which there is no shelter to flee from predators such as eagles or jackals, says Townsend. By nature, the animals tend to avoid open areas in dangerous situations. "In case of an imminent threat, meerkats use the cover provided by bushes and other elements of their environment", explains Perony. This study raises hopes that [wild animals](#) can adapt to a certain extent to the increasing perturbation of their natural environment.

## Meerkats

Meerkats have long been studied at the Kalahari Meerkat Project, located within the Kuruman River Reserve (South Africa). Animals from the study groups are dye-marked to allow for individual identification. They are habituated to the presence of human observers. Meerkats live in groups of up to 40 members. Each group is dominated by a pair of alpha individuals, who are the only ones allowed to reproduce. The other individuals help the dominant pair to care for the young, which are often related to them. The [meerkats'](#) group structure is highly complex and has long fascinated behavioural scientists.

**More information:** Perony, Nicolas and Townsend, Simon W. Why did the meerkat cross the road? Flexible adaptation of phylogenetically-old behavioural strategies to modern-day threats, *PLOS ONE* (2013). [DOI: 10.1371/journal.pone.0052834](#)

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