Animal magnetism provides a sense of direction

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They may not be on most people's list of most attractive species, but bats definitely have animal magnetism. Researchers from the Universities of Leeds and Princeton have discovered that bats use a magnetic substance in their body called magnetite as an 'internal compass' to help them navigate.

Dr Richard Holland from Leeds' Faculty of Biological Sciences and Professor Martin Wikelski from Princeton University studied the directions in which different groups of Big Brown bats flew after they had been given different magnetic pulses and released 20km north of their home roost. The findings are published in the current issue of *PLoS ONE.*

Dr Holland was part of the team which, in 2006, discovered that bats used the Earth's magnetic field to get around, but until now, how bats were able to sense the field was still unknown. Big Brown bats were put through a magnetic pulse 5000 times stronger than the Earth's magnetic field, but orientated the opposite way. The bats were put into a coil (10cm diameter by 10 cm long) which produced a pulse of 0.4 seconds that was 0.1 tesla in strength.

Dr Holland said: "We had three groups of bats. One had undergone the magnetic pulse with a different orientation, and one control group had received no pulse at all. The third group had undergone the pulse, but in the same orientation as the Earth's magnetic field. By including this group, we could easily see if changes in behaviour were the result of

confusion caused by the pulse itself rather the impact of its orientation on the magnetite."

The control group made their way home as normal, as did those which had undergone the pulse with the same orientation to the Earth's magnetic field. But of those which had been through the pulse with a different orientation, half went home but half went in the opposite direction.

"This clearly showed that it is the magnetite in their cells which give bats their direction as we were able to change how the bats used it as an internal compass, turning their north into south," says Dr Holland. "But as only half were affected, it's likely there is another mechanism as well, which in some bats enabled them to override the impact of the pulse."

Magnetite is found in the cells of many birds and mammals, including humans, but if we were once able to find our way by an internal compass, it's a skill we appear to have lost long ago.

The researchers were able to conduct their unique experiment by use of radio transmitters on the bats which were monitored from the ground and from a plane to verify the signals were correct. However, this kind of monitoring is limited to short distances, so the team is now in discussions with NASA and ESA about using satellites to help track smaller migratory birds and mammals.

The satellites currently used by scientists can only track larger sea birds over 300g, although 60 per cent of mammals and 80 per cent of birds are below this size. The technology exists to track this size of target, but no satellite has yet been launched.

Dr Holland believes tracking this size of bird or mammal is of key importance. "Birds and mammals carry and spread diseases, such as

rabies or bird flu, and plotting their migration and movement can help us predict this spread. Large movements of birds can act as pests in themselves, but other species are scarce and need conservation support. We were only able to make our discovery through studying bats in the wild. But for many creatures, satellite tracking is the only way to study them in their natural habitat to help tackle these issues."

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