

## Source of animals' magnetic sense found



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Scientists say they've identified 'internal compass needles' in the noses of rainbow trout, helping explain the way many creatures can navigate using the Earth's magnetic field.

Neuroscientists recently discovered ['GPS maps'](#) in pigeons' brains, explaining how information on magnetism is encoded in the brain - but until now, nobody's ever been able to pinpoint the cells that detect the magnetic field and convert the information into nerve impulses.

"The field penetrates the whole organism, so such cells could be located almost anywhere, making them hard to identify," says University of Munich geophysicist Michael Winklhofer, whose team has finally identified magnetosensory cells in the olfactory epithelium of the trout.

The researchers first used enzymes to break down the sensory epithelium into single cells, which were then stimulated with an artificial, rotating magnetic field.

The scientists were then able to identify and collect single magneto-responsive cells; and, to their surprise, found they were more strongly magnetic than previously thought.

The findings also explain why high-tension cables perturb animals' magnetic sense.

The cells sense the field by means of micrometer-sized inclusions composed of magnetic crystals, probably made of magnetite. These inclusions are coupled to the cell membrane, changing the

electrical potential across the membrane when the crystals realign in response to a change in the ambient magnetic field.

"This explains why low-frequency magnetic fields generated by powerlines disrupt navigation relative to the geomagnetic field and may induce other physiological effects," says Winklhofer.

The findings raise the question of whether [human cells](#) are capable of forming magnetite and if so, how much. It's already been discovered that human retinas [contain the same protein](#) that senses magnetism in drosophila.

If the answer is yes, it could perhaps explain the so-called 'electrosmog' which many people claim to be able to feel.