

Study: Iron minerals in birds' bills may serve as a magnetometer

March 14 2007

It has long been recognized that birds possess the ability to use the Earth's magnetic field for their navigation, although just how this is done has not yet been clarified. However, the discovery of iron-containing structures in the beaks of homing pigeons in a new study by Gerta Fleissner and her colleagues at the University of Frankfurt offers a promising insight into this complex topic. The article will be published online mid-March in Springer's journal *Naturwissenschaften*.

In histological and physicochemical examinations in collaboration with HASYLAB, the synchrotron laboratories based in Hamburg, Germany, iron-containing subcellular particles of maghemite and magnetite were found in sensory dendrites of the skin lining the upper beak of homing pigeons. A dendrite is a branched extension a nerve cell (neuron).

This research project found that these dendrites are arranged in a complex three-dimensional pattern with different spatial orientation designed to analyze the three components of the magnetic field vector separately. They react to the Earth's external magnetic field in a very sensitive and specific manner, thus acting as a three-axis magnetometer.

The study suggests that the birds sense the magnetic field independent of their motion and posture and thus can identify their geographical position.

The researchers further believe that this ability is not unique to homing pigeons as they expect that the 'pigeon-type receptor system ... might

turn out to be a universal feature of all birds'. Equally, this concept might not only exclusively apply to birds, since it has been shown that many animals display behavior that is modified or controlled by the Earth's magnetic field.

The meaning of these minute iron oxide crystals goes farther than their amazing ability to help pigeons home. Research into how they work has caught the interest of nanotechnologists concerning their potential application for accurate drug targeting and even as a data storage device. The main problem, however, lies in their synthetic production. According to Gerta Fleissner and her colleagues, "Even though birds have been producing these particles for millions of years, the main problem for scientists who want to find benefits from their use will be the technical production of these particles".

Source: Springer

Citation: Study: Iron minerals in birds' bills may serve as a magnetometer (2007, March 14) retrieved 19 April 2024 from <https://phys.org/news/2007-03-iron-minerals-birds-bills-magnetometer.html>

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