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IS THE BLIND CAVE SALAMANDER PROTEUS ANGUINUS EQUIPED FOR MAGNETIC ORIENTATION ?

H. Bouquerel and **J.P. Valet**,
Institut de Physique du Globe de Paris, France,

The Proteus anguinus is a blind cave salamander which can develop the ability of using the earthŠs magnetic field for orientation and navigation. It has been shown that the strength of the geomagnetic field is not strong enough to excite the electroreceptors of these animals through induction mechanism so that the most likely hypothesis is that they would use cristals of magnetite as permanent magnets. We have been looking for evidence of remanent magnetism in several proteus collected from the underground CNRS laboratory at Moulis (France). Because the level of natural remanent magnetization, if any, was too low to be measured with confidence using a 3 axis squid 2G magnetometer (even bringing the animals as close as possible to the sensors), we stepwise remagnetized the samples between 0.2 and 1.2T. Measurements were performed in different parts of three proteus bodies. No significant magnetization was detected in the head, most of the signal being concentrated in the lower body of the animal. Saturation was attained after 0.2T while stepwise demagnetization by alternating field showed that most magnetization was removed after 40 mT (medium destructive field, MDF of about 10 mT), which is typical of magnetite. Independent measurements of clay soils taken from the surrounding immediate environment of the animals reveal a different magnetic signature for saturation, MDF and viscosity. Thus there is no apparent and direct link between food absorbed from their environment and the magnetic remamence of the animals. New experiments are currently in progress to determine whether magnetite is the unique magnetic carrier and also to provide better clue about the magnetic granulometry and its distribution.