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Self-reversal of remanent magnetisation: Experiments and models

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The need for more abundant and more reliable records of the direction and intensity of the magnetic palaeofield has triggered a wealth of rock magnetic studies dealing with remanence acquisition processes. Along with this comes a renewed interest in the phenomenon of self-reversal, a term which describes that the remanent magnetisation of a certain magnetic material is directed opposite to the external field in which this magnetisation was acquired. Louis Néel was the first to predict the possibility of self-reversal and suggested theoretical models which could lead to a self-reversed magnetisation — before any experimental evidence for the phenomenon was reported in the literature. These models are based either on intrinsic properties of a single ferrimagnetic phase or on the interaction of two different phases. Since then, several examples of self-reversed magnetisation have actually been found. In recent years, new experimental techniques like low-temperature magnetometry and advances in microchemical and micromagnetic imaging have yielded new insights into the underlying mechanisms. Detailed models taking into account composition and geometry of the magnetic phases involved in self-reversal have been brought forward. In this presentation, these new experimental results and models will be reviewed. The consequences for sample selection, measurement procedures and interpretation of palaeomagnetic data will be discussed on the basis of case studies. Additionally, implications for remanence acquisition processes in general will be examined.