Magnetostatic interactions between magnetic minerals are known to affect the magnetic properties of many rock and sediment samples of importance to paleomagnetism. If these interactions are not properly accounted for, the measurements can lead to erroneous interpretations. Progress in understanding the effect of interactions is limited by our inability to model thermal relaxation in complex systems. Thermal relaxation involves jumps over energy barriers between magnetic states, and affects all magnetic processes to some extent. It is particularly important in acquisition of thermoremanent magnetization (TRM) as igneous rocks cool from above the Curie temperature. TRM, viscous remanent magnetization, and frequency-dependent susceptibility are three examples of magnetic behavior that is time dependent because of thermal fluctuations.

A new general method for solving for time-dependent change in magnetization has been developed. This involves two main steps. The first is to find all the possible stable states at a given temperature and magnetic field and map the connections between them over energy barriers. To do this, the equilibrium equations are expressed as a system of polynomial equations, after which all possible solutions of the equations can be found using a homotopy continuation package called Bertini. The second step is to calculate the relaxation rate over each barrier and combine all the rates in a master equation. The solution of this master equation gives the time dependence of the magnetization for the system. This method can be used to model the response to temporal variations in time and temperature.