Quenched Randomness, the Imry-Ma theorem, and Topology
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College of the City University of New York — In 1975, Imry and Ma made the
analytical prediction that an exchange model in d dimensions under the influence
of a weak random field of strength h_r will have a correlation length of $R_f \propto h_r^{-\frac{2}{4-d}}$
. However, numerical results since then have not given strong support to this an-
alytical result. In our numerical studies, we have found that models that support
topological structures, such as vortices or skyrmions, show spin states that have
hysteresis, are highly dependent on initial conditions, and do not follow Imry-Ma
prediction. Meanwhile, models that do not support these topological structures fol-
low the Imry-Ma prediction, implying that the Imry-Ma state is not reached because
of topological effects. These findings have implications for random magnets and flux
lattices.

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