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**Hairy balls and flux lines in superconductors** MARK LAVER, Paul Scherrer Institut; Risoe DTU; University of Copenhagen, TED FORGAN, School of Physics and Astronomy, University of Birmingham — Many physical phenomena originate from geometrical effects rather than from local physics. For example, the hairy ball theorem — a hairy sphere cannot be combed — is fulfilled by the atmospheric circulation with the existence of stratospheric polar vortices, and the fact that there is always at least one place on Earth where the horizontal wind is still. We examine the consequences of the hairy ball theorem for the flux line lattice (FLL). We find that discontinuities must exist in lattice shape as a function of field direction relative to the crystal. The remarkable ways in which the hairy ball theorem is fulfilled are demonstrated for FLL's in superconducting niobium. We show that extraordinary, unconventional flux line lattice shapes that spontaneously break the underlying crystal symmetry are surprisingly likely across all Type-II superconductors, both conventional and unconventional.

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