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Skyrmions in Solids K.V. SHANAVAS, S. SATPATHY, Department of Physics & Astronomy, University of Missouri — The recent observation of skyrmions in magnetic solids has raised considerable interest in this new magnetic state. The skyrmion state is a novel, vortex-like spin structure in a magnetic solid, anticipated to produce unconventional spin-electronic functions such as the topological Hall effect. Experiments have confirmed their existence in crystals such as MnSi and FeGe when subjected to small magnetic fields. Competition between ferromagnetic exchange, the Dzyaloshinskii-Moriya interaction, and the Zeeman coupling to the external magnetic field are expected to stabilize this unique magnetic arrangement. Of these, the anisotropic Dzyaloshinskii-Moriya $\vec{D} \cdot \vec{S_i} \times \vec{S_j}$ interaction, can exist in crystals with spin-orbit interaction but no inversion symmetry. We discuss the origin of the Dzyaloshinskii-Moriya interaction in these solids based on density-functional study of the electronic structure of MnSi, the prototypical solid for skyrmions. The present state of research in this area as well as open questions and future outlook will be discussed.

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