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Between order and disorder: the mathematics of quasicrystals

Quasicrystals are materials that lie somewhere between crystals and disordered materials. This talk is an introduction to the mathematics that has been created to model and explain them. We will start with various characterizations of mathematical crystals, where the underlying structure is based on lattices, and show how nicely these can be generalized to encompass some of this intermediate world of aperiodic order.

A characteristic feature of quasicrystals is their crystal-like diffraction, which is deeply related to their internal order. We will indicate some of the known ways of producing aperiodic pure point diffractive sets and the current state of trying to characterize them.

At the end of the day, aperiodic order seems to be a reconciliation of precise local order and average global order. We will show how, through the use of dynamical systems, this idea can be made more precise.