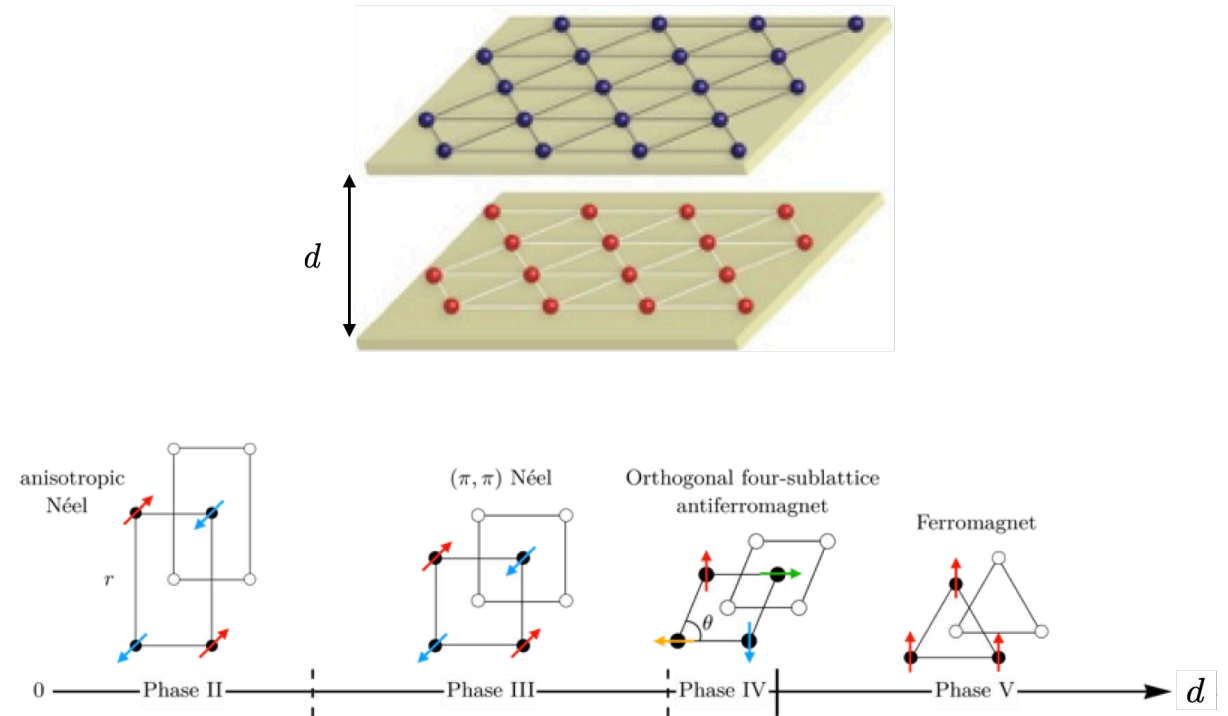


Electron solids are states of matter in which itinerant electrons spontaneously crystallize. They play a prominent role in properties of two-dimensional (2D) materials, including graphene and transition-metal dichalcogenides. Among other interesting behaviors, these crystals are expected to exhibit exotic quantum magnetism arising from the couplings between localized electron spins.

Researchers in the Wisconsin MRSEC have shown that bilayer electron crystals exhibit a variety of magnetic states depending on the distance between the two layers and the number of electrons in each layer. These states include ferromagnetic and antiferromagnetic arrangements of electron spins, as well as exotic states like the valence-bond solid and spin-nematic. These results establish bilayer crystals as a promising platform for studying quantum magnetism and provide guidance for experiments characterizing electron solids realized in 2D materials.



Wisconsin MRSEC researchers determined the magnetic ground states of various bilayer electron crystals realized by tuning the interlayer separation d and electron concentration.