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## Tailoring magnetic states of matter atom-by-atom

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Some of the most fascinating discoveries in the last century, such as complex magnetic order and superconductivity, are based on the collective nature of quantum particles. The field of quantum matter aims at harnessing these many-body properties in materials toward energy-efficient technologies based on the interplay of the charge, spin, and orbital degrees of freedom. Insight into the quantum world requires access to individual spins and the ability to manipulate their interactions with their environment. I will review exciting developments based on scanning tunneling microscopy (STM) which opens the capabilities of magnetic imaging at the single atom level and bottom-up fabrication of atomic magnets toward what we coin “magnetic LEGOs.” I will exemplify how magnetic atoms may be used for bit storage, as well as Boolean logic based on the magnetic interactions of single atoms, and address new results addressing non-collinear magnetism and novel quantum states of matter.