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Spins and photons: quantum optics with defect centers in diamond

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Individual defects in crystalline materials can have electronic properties akin to those of isolated trapped atoms or ions. Recently, the nitrogen vacancy center, a type of defect in diamond, has emerged as as a particularly compelling example. Like atoms, these defect centers have spin degrees of freedom and and optical transitions that make them an attractive platform for building quantum information technologies. Their spin states might someday be used to store and manipulate quantum information, with photons connecting individual defects into a useful computational network or secure communication system. This talk will introduce the properties of nitrogen-vacancy defect centers relevant to such a vision, and present some recent results on the path toward creating a high-efficiency spin-photon interface using fiber-based optical microcavities.

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