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Fractons, geometrically

I will discuss how fracton physics can be studied systematically within the geometric framework of double field theory (DFT). I will argue that the restricted mobility and large degeneracy of quantum states can be attributed to the generalized geodesics and infinite-dimensional isometries present in non-Riemannian backgrounds of DFT. Moreover, it turns out that a DFT Yang-Mills or Maxwell theory reduces to an ordinary one coupled to a strain tensor of elasticity theory, providing a unifying description of photons and phonons. I will show that when charged particles are minimally coupled to this photon-phonon theory, their immobility along non-Riemannian directions is lifted to a saturation velocity, and the particles acquire an effective mass even in the purely Riemannian case, yielding predictions for polaron physics and time crystals.

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