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Az Zarreh Taa Aaftaab: The Role of General Relativity in the Structure of Elementary Particles of Matter

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It was a largely unfulfilled dream of Einstein to arrive at a quantum theory of atomistic matter that included electrodynamic phenomena, and one in which the principles of general relativity would reign supreme. Even though he is generally considered to have failed in this quest, his unifying vision remains a powerful one to this date. In this talk we explore some of the ways in which Einstein's dream may one day be realized, including (1) a general-relativity-based formulation of the joint evolution of classical fields together with point-particles that are sources of those fields, (2) a well-motivated deformation of classical nonlinear theories to quantum theories in which the motion of particles is guided by linear waves on particle configuration space, and (3) ring-like particles inspired by general relativity and a possible resolution of the dark matter puzzle.

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