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Origin of the Mott Gap¹ PHILIP PHILLIPS, ROBERT G. LEIGH, Loomis Laboratory of Physics, University of Illinois, Urbana, Ilinois 61801 — We show exactly that the only charged excitations that exist in the strong-coupling limit of the half-filled Hubbard model are gapped composite excitations generated by the dynamics of the charge 2e boson that appears upon explicit integration of the highenergy scale. At every momentum, such excitations have non-zero spectral weight at two distinct energy scales separated by the on-site repulsion U. The result is a gap in the spectrum for the composite excitations when U exceeds the bandwidth. Consequently, we resolve the long-standing problem of the cause of the charge gap in a half-filled band in the absence of symmetry breaking.

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