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Superconductivity in zigzag CuO chains EREZ BERG, STEVE KIVELSON, Stanford University — Superconductivity was recently discovered in $Pr_2Ba_4Cu_7O_{15-\delta}$ with a maximum T_c of about 12K [1]. This material's structure is identical to that of the high T_c superconductor YBCO$-$247. However, the cupper-oxide planes in this material (which are essential for the superconductivity in YBCO) are known to be insulating. Therefore it is believed that the superconductivity originates in the array of quasi-1d CuO chains and NMR experiments appear to corroborate this belief. In this work we study a microscopic model for a CuO double-chain (zigzag chain) using a combination of bosonization and numerics (DMRG). We derive a schematic phase diagram for this model, which exhibits a narrow doping region where superconducting correlations are dominant and a broader range where CDW correlations are dominant. Unlike the situation in the two-leg Hubbard ladder, superconductivity does not arise from the formation of a spin gap. Rather, it is related to a subtle ordering driven by magnetic interactions. The implications for experiment are discussed.
[1] See, for example, Y. Yamada and A. Matsushita, Physica C 426-431, 213(2005).

Erez Berg
Stanford

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