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Is superconductivity in cuprates governed by topological constraints?

After more than thirty years of research, the microscopic mechanism of high-*Tc* superconductivity is still unknown. However, the remarkable universality of the cuprate *Tc*-dome suggests a very fundamental unifying principle.

The superconducting gap is known to persist above *Tc* in the enigmatic pseudogap phase. So, contrary to BCS, the gap cannot be the order parameter of the transition.

In this work, we focus on the typical *T-p* phase diagram where *p* is the hole carrier concentration. We propose that both the *Tc* -dome and the pseudogap line *T(p) arise from a unique and identifiable principle: the interaction of localized hole pairs, or* 'pairons*', in real space on an antiferromagnetic square lattice [1].

In this view, the pseudogap state is revealed: it consists of incoherent pairons while the superconducting state is the result of a *disorder to order* transition.

The model matches both the *T** and Tc experimental lines, with only one adjustable parameter, which we identify as an effective magnetic exchange energy.

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[1] Yves Noat, Alain Mauger, William Sacks, Superconductivity in cuprates governed by topological constraints. Physics Letters A 444, 128227 (2022).

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