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Pseudogap temperature along the Widom line of a first-order transition in doped Mott insulators GIOVANNI SORDI, Institut Laue-Langevin, Grenoble, France, PATRICK SEMON, Universite de Sherbrooke, K. HAULE, Rutgers University, A.-M. S. TREMBLAY, Universite de Sherbrooke and Canadian Institute for Advanced Research — A state of matter with unusual physical properties, dubbed "the pseudogap", appears below a characteristic temperature T^* in hole-doped high-temperature superconductors. In many cases, it is not even clear whether T^* is a crossover or a phase transition. We construct the normal-state phase diagram of the two dimensional Hubbard model using cellular dynamical mean-field theory. We find that T^* is a crossover line above the critical endpoint of a first-order phase transition between two metallic phases, one with a pseudogap and one without. Thus T^* appears in a new light: it is an unexpected example of a phenomenon observed in fluids, namely a sharp crossover between different dynamical regimes along a line of thermodynamic anomalies that appears above a first-order phase transition, the Widom line. Our findings thus suggest that the critical point of a first-order transition, and not a quantum critical point, can be the organizing principle for the rich behavior of the normal state of the cuprates. Refs: G. Sordi et al., PRL 104, 226402 (2010); G. Sordi et al., PRB 84, 075161 (2011); G. Sordi et al., arXiv:1110.1392 (2011).

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