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Quantum critical point underlying the pseudogap state in underdoped cuprate superconductors[1]

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Cuprate superconductors rank among the most complex materials that are known in the universe. Faced with this complexity, scientists have adopted two types of approaches. In a bottom up approach, one considers that strong correlations occur at a high energy scale of roughly 1 eV upon very strong Coulomb interactions. In the top down approach one considers that one universal singularity at very low temperatures is responsible for complexity of the phase diagram. In this talk we will argue that the strong quantum fluctuations experienced at the proximity to a anti-ferromagnetic Quantum Critical Point (QCP) is responsible for a cascade of phase transitions in the charge and superconducting channels. We will discuss in this context the emergence of the pseudo-gap and charge order modulations. Symmetries and relations to experimental observations will be addressed.

[1]Work done in collaboration with K.B. Efetov (Bochum) and H. Meier (Yale)