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Local pairing and the origin of pseudogaps in $Bi_2Sr_2Ca_2CuO_{8+\delta}$ probed with high-resolution STM measurements[1] KENJIRO K. GOMES, ABHAY PASUPATHY, AAKASH PUSHP, Princeton Nanoscale Microscopy Laboratory, Department of Physics, Princeton University, SHIMPEI ONO, YOICHI ANDO, CRIEPI, Japan, ALI YAZDANI, Princeton Nanoscale Microscopy Laboratory, Department of Physics, Princeton University — The evolution of the local electronic density of states in $Bi_2Sr_2Ca_2CuO_{8+\delta}$ has been measured as function of doping (x=0.12-0.22) and temperature (20-180K) using state-of-art variable temperature scanning tunneling microscopy (STM). These measurements allow the first characterization of spatially varying energy gaps in both the superconducting and non-superconducting states with temperature. From these observations, we are able to demonstrate that pseudogaps observed at optimal doping at temperatures as high as 50K above T_c are due to pairing correlations. We have been able to extract a remarkably universal relation that describes the strength of local pairing to a local pairing temperature, for samples which are weakly underdoped to highly overdoped. With decreasing doping, we show that the evolution of the local electronic states with temperature cannot be captured with a single pairing energy scale, signaling the presence of another phenomenon, which is unrelated or perhaps competing with superconductivity.

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