# Visualizing strongly-correlated electrons with a novel scanning tunneling microscope

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# PROPOSITIONS

accompanying the thesis

## Visualizing strongly-correlated electrons with a novel scanning tunneling microscope

1. The phenomena of pseudogap and electronic order are not specific to cuprate superconductors, but generic to a wider class of lightly doped Mott insulators. *(Chapter 4 of this thesis).*

2. In order to build a very stiff scanning tunneling microscope, both materials and geometry need to be optimized. *(Chapter 3 of this thesis).*

3. Even when STM spectra on poorly conducting materials do not change with tip-sample distance, one cannot rule out the presence of tip-induced band bending. *(Chapter 5 of this thesis).*

4. Photoemission, optics and transport results on electron-doped $Sr_2IrO_4$ have to be interpreted in light of the spatially inhomogeneous electronic structure as found by STM experiments. *(Chapter 4 of this thesis).*

5. The gradual suppression of the Mott gap as reported by Yan et al. on surface-doped $Sr_2IrO_4$ is due to disorder rather than to electron doping. *Yan et al., Phys. Rev. X* ***5****, 041018 (2015).*

6. Zhao et al. do not consider electric field penetration when retrieving the gap value on the Mott insulating phase of $Bi_2Sr_2CaCu_2O_{8+x}$ and, therefore, the estimated gap width is not reliable. *Zhao et al., Nat. Mater.* ***18****, 103 (2019).*

7. While Wang et al. conclude to have good agreement between STM quasiparticle interference measurements and photoemission results, the extracted Fermi velocities do not agree. *Wang et al., Nat. Phys.* ***13****, 799 (2017).*

8. The enhancement of superconductivity in $Bi_2Sr_2CaCu_2O_{8+x}$ break junctions upon irradiation with microwave power, as claimed by Vedeneev et al., can simply be explained by energy broadening. *Vedeneev et al., Phys. Rev. B* ***78****, 052509 (2008).*

9. An efficient design for a liquid helium dewar should not contain tubes prone to develop Taconis oscillations.

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