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Low-lying electronic structure and possible intrinsic gap control in J = 1/2 Mott insulating perovskite iridate $Sr_3Ir_2O_7$[1] CHANG LIU, SU-YANG XU, NASSER ALIDOUST, MADHAB NEUPANE, M. ZAHID HASAN, Joseph Henry Laboratory and Department of Physics, Princeton University, Princeton, New Jersey 08544, USA, TAY-RONG CHANG, HORNG-TAY JENG, Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan, HSIN LIN, ROBERT MARKIEWICZ, ARUN BANSIL, Department of Physics, Northeastern University, Boston, Massachusetts 02115, USA, CHETAN DHITAL, SOVIT KHADKA, YOSHINORI OKADA, VIDYA MADHAVAN, STEPHEN WILSON, Department of Physics, Boston College, Chestnut Hill, Massachusetts 02467, USA — Using angle resolved photoemission spectroscopy, the ground state of perovskite iridate $Sr_3Ir_2O_7$ is found to be in close vicinity to a metal-to-insulator transition. Photoemission data reveal two bands extending up to surprisingly small binding energies around the Brillouin zone corner X, followed by a van Hove-like flat portion at the top of the valence bands. One of these bands form a saddle point while the other shows apparent spectral weight suppression along the the in-plane antiferromagnetic vector direction (Γ-Σ), signaling a possible electronic response to the additional long range order. The energy scale of the Mott insulating gap shows considerable sample-to-sample variation, which points to possible intrinsic control of low temperature resistivity by apical oxygen deficiency - a process suggested by transport experiments and, importantly, similar to the doping process of the cuprates that gives rise to high temperature superconductivity.

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