The role of correlations in the low energy electronic structure of lightly electron doped \( \text{Sr}_2\text{IrO}_4 \) and \( \text{Sr}_3\text{Ir}_2\text{O}_7 \). ALBERTO DE LA TORRE, FLAVIO BRUNO, ZHIMING WANG, ANNA TAMAI, CHRISTOPHE BERTHOD, DIDIER JACCARD, University of Geneva, ALASKA SUBEDI, Max Planck - Hamburg, ANTOINE GEORGES, Ecole Polytechnique, CNRS, ROBIN PERRY, University College London, FELIX BAUMBERGER, University of Geneva — We characterized the emergence of exotic electronic ground states in lightly electron doped \( \text{(Sr}_{1-x}\text{La}_x\text{)}_2\text{IrO}_4 \) and \( \text{(Sr}_{1-x}\text{La}_x\text{)}_3\text{Ir}_2\text{O}_7 \) by ARPES. In the single layer iridate, a large Fermi surface with nodal coherent spectral weight and antinodal pseudogap emerges, concomitantly with the collapse of the Mott gap, upon doping [1]. On the other hand, in \( \text{Sr}_3\text{Ir}_2\text{O}_7 \) a small non-gapped Fermi surface with coherent quasiparticles, together with a reduction of the correlated gap throughout the entire Brillouin Zone is observed when doping above the insulator to metal transition [2]. By comparing the electronic structure of these two materials, we provide evidence that the interplay between spin-orbit and electron-electron correlations (\( U \)) in \( \text{(Sr}_{1-x}\text{La}_x\text{)}_2\text{IrO}_4 \) and \( \text{(Sr}_{1-x}\text{La}_x\text{)}_3\text{Ir}_2\text{O}_7 \) is rather different: while in \( \text{Sr}_2\text{IrO}_4 \) this interplay results in a pseudospin-1/2 single band Mott insulator with a phenomenology very similar to that of cuprates, in \( \text{Sr}_3\text{Ir}_2\text{O}_7 \) \( U \) enhances the bilayer splitting gap to originate a ground state resembling that of a correlated semiconductor. [1] A. de la Torre et al, PRL 115, 176402 (2015); [2] A. de la Torre et al, PRL 113, 256402 (2014)