

MAR17-2016-020350

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Visualizing Landau Orbits and a Nematic Quantum Hall Liquid with the Scanning Tunneling Microscope

ALI YAZDANI, Princeton University

Nematic quantum fluids with wavefunctions that break the underlying crystalline symmetry can form in interacting electronic systems. We examine the quantum Hall states that arise in high magnetic fields from anisotropic hole pockets on the Bi(111) surface. Spectroscopy performed with a scanning tunneling microscope shows that a combination of local strain and many-body Coulomb interactions lift the six-fold Landau level (LL) degeneracy to form three valley-polarized quantum Hall states. We image the resulting anisotropic LL wavefunctions and show that they have a different orientation for each broken-symmetry state. The wavefunctions correspond precisely to those expected from pairs of hole valleys and provide a direct spatial signature of a nematic electronic phase. Reference: Benjamin E. Feldman, Mallika T. Randeria, Andras Gyenis, Fengcheng Wu, Huiwen Ji, R. J. Cava, Allan H. MacDonald, Ali Yazdani, *Science* 354, 6310 (2016).