Broken rotational symmetry in underdoped Fe-arsenide superconductors

Ian Fisher
Geballe Laboratory for Advanced Materials &
Department of Applied Physics, Stanford University,
And Stanford Institute for Materials and Energy Sciences,
SLAC National Accelerator Laboratory.

Common to the high Tc cuprates, superconductivity in the recently discovered Fe arsenides and related compounds is associated with suppression of an antiferromagnetic ground state. Evidence points to spin fluctuations associated with a partially nested Fermi surface playing an important role in the pairing mechanism. On the underdoped side of the phase diagram, in addition to the antiferromagnetic transition, the materials also suffer a phase transition that breaks the 4-fold rotational symmetry of the high-temperature crystal structure, this occurring at either the same or higher temperature then the Neel transition. Emerging evidence based on measurements of detwinned single crystals reveals a dramatic electronic anisotropy associated with this nematic transition. Aspects of this behavior are reminiscent of the pseudogap phase observed in the cuprates, suggestive of an additional commonality between the two classes of material. The distinct phase transition observed in the Fe pnictides allows a cleaner investigation of the origins, and consequences, of this effect.