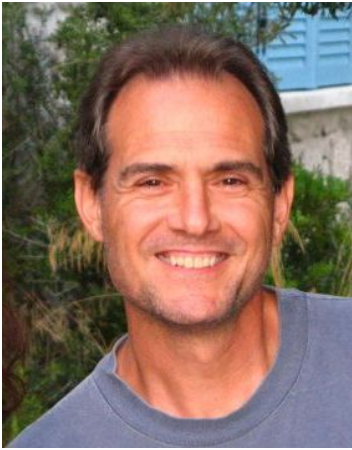


# Theory of disorder and quasiparticle interference in superconductors

– P.J. Hirschfeld , University of Florida



**SEMINAR**  
**WEDNESDAY**  
**MARCH 25**  
**1008B DMC**  
**LSU**  
**3:30 PM**

I present a novel theoretical approach to the theoretical calculation of STM real-space images and quasiparticle interference (QPI) patterns in high-temperature superconductors. The usual Bogoliubov de-Gennes eigenvalues and eigenvectors are used, together with first-principles Wannier functions for a given material, to calculate images of impurities on the surface with atomic-scale resolution comparable to experiment. These images automatically reflect local symmetries of the system, including those away from the high-symmetry plane traditionally calculated. Phenomenological “filter” effects are discussed and critiqued from this perspective. Representations of both real-space defects and QPI patterns are shown to be vastly improved relative to experiments on Fe-based systems and cuprates. Finally, I discuss ideas about how QPI can be used qualitatively to probe gap sign changes in multiband systems.

*Peter Hirschfeld received his Ph.D. in physics from Princeton University in 1985 and held postdoctoral research appointments at the Technical University of Munich and Stanford University before joining the faculty at the University of Florida in 1988. He has also served as visiting professor for a semester or more at U. Karlsruhe, U. Augsburg, U. Paris-Sud, Stanford University and the University of Frankfurt since then. He has supervised 13 Ph.D. students and taught physics at all levels. He was awarded the Friedrich-Bessel Prize of the Alexander von Humboldt Foundation in 2001 for his contributions to superconductivity theory, made a fellow of the American Physical Society in 2004, and awarded a Mercator Professorship of the German Science Foundation in 2013-14.*  
<http://www.phys.ufl.edu/~pjh/>

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LA Tech - 122 Nethken Hall, LSU - 1008B DMC, SUBR - 211 J.B. Moore Hall,  
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