TCSUH Special Seminar

Where to Find the Next High Temperature Superconductors

Prof. Warren E. Pickett

Distinguished Professor of Physics
University of California Davis

Tuesday, April 21, 2015
Room 102, University of Houston Science Center
4:00 – 5:00 p.m.

ABSTRACT:

Support for the search for higher temperature superconductors (HTS) has strengthened somewhat in recent years, with encouragement arising from the occasional serendipitous discovery of impressive new classes of HTS. These recent discoveries highlight the fact that two-dimensional (2D) systems are the most promising platform for the *room temperature* HTS so long pursued, as advocated by Ginzburg and Kirzhnits in the 1960s. I will survey the current classes of 2D HTS materials, addressing both conventional (electron-phonon pairing) and exotic (magnetic and electronic pairing) materials and phenomena. In the former case, there is a direct recipe for (potentially great) improvement, using materials design. In the latter case, the lack of any detailed understanding of the mechanism precludes rational design, but non-rational (but not irrational) discoveries have intermittently had great success and may yet provide superior superconductors. I will conclude with discussion of recent discoveries.

Research supported by the National Science Foundation.

BIO:

Warren Pickett obtained his B.S. (Physics, Math) and M.S. (Physics) degrees at Wichita State University, and completed his PhD at Stony Brook University in theoretical condensed matter physics in 1975. He had postdoctoral research appointments at the University of Bristol, U.K., UC Berkeley, and Northwestern University, where his research centered on the electronic structure of crystalline metals and semiconductors, semiconductor interfaces, and superconductivity. In 1979 he accepted a research scientist position at the Naval Research Laboratory in Washington DC. Early in his years at NRL, Warren increased his activity in large scale calculations of the properties of condensed phases, using the NRL ASC supercomputer and early Cray machines (Boeing) to carry out a study of, for example, the complex-structured *heavy fermion superconductor* UBe_{13}.

He was elected Fellow of the American Physical Society in 1989, and shared 2nd Prize in the IBM Supercomputing Competition in 1990. At NRL Pickett was awarded the E. O. Hulburt Award in 1990 and the Sigma Xi Technical Achievement Award in Pure Science in 1993. He was appointed Senior Scientist at NRL in 1992. He received Alan Berman Research Publication Awards at NRL in 1983, 1998,1989, and 1992. In 1997 Warren took a professorship in physics at UC Davis, where he is a participant in an interdisciplinary program on nanophase research as well as working in condensed matter physics research programs. In 2003 he was named

Distinguished Professor of Physics. In 2012, he enjoyed a Simons Foundation Prefessorship while on sabbatical in Singapore and Europe.

Warren Pickett has had visiting professor positions at Daresbury Laboratory (U.K.), Cambridge University, National University of Singapore, and Baptist University of Hong Kong. During his Humboldt Professorship in 2005-6 he enjoyed visiting professor positions at the Max Planck Institute, Stuttgart, and the Leibniz Institute for Solid State Research (IFW), Dresden. In 2013 he was appointed Adjunct Professor at SungKyunKwan University (SKKU), South Korea, and in 2014 became Adjunct Professor at Sharif University of Technology, Tehran.

Warren Pickett served on the editorial board of the *Journal of Superconductivity* several years after its foundation in 1989, and on the editorial board of *Chemical Design Automation News* from 1993-1998. He was a member of the Council of the American Physical Society from 1996-1999. From 2001-2005 he served as Editor of the *Journal of the Physics and Chemistry of Solids*, published by Elsevier Press.

Warren Pickett served as Chair of the Physics Department 2008-2011. During much of this same time he served four years 2008-2012 as Vice Chair, Chair-Elect, Chair, and Past Chair of the Division of Condensed Matter Physics of the American Physical Society.

His research focusses on pursuing a first principles (purely theoretical) description of the properties of complex crystalline materials, and he enjoys collaborations with solid state chemists and materials scientists as well as solid state theorists and experimentalists. His interest includes magnets and superconductors and magnetic materials that become superconducting; ferroelectric insulators that become ferromagnetic; materials with topological electronic states; nanoscale-structured materials such as metal-oxide interfaces and heterostructures. He has engaged in computational materials design since the early 1980s. He has nearly 500 publications in the primary scientific literature, and has had collaborations in Europe, Asia, South America, and across the USA.

Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8213 as soon as possible.