

MAR10-2009-001632

Abstract for an Invited Paper  
for the MAR10 Meeting of  
the American Physical Society

### **A Possible Path from BCS through HTS to VHTS**

C.W. CHU, University of Houston and Lawrence Berkeley National Laboratory

Three years after celebrating the 50th anniversary of the BCS theory and the 20th anniversary of the discovery of high temperature superconductivity (HTS), it appears to be most fitting for us to contemplate the possibility of very high temperature superconductivity (VHTS). VHTS, preferably at room temperature, if achieved, could change the world both scientifically and technologically. Unfortunately, it has long been considered by some to belong to the domain of science fiction and to occur only “at an astronomical distance and under an astronomical pressure.” With the advent of liquid nitrogen superconductivity in 1987, the outlook has become much brighter. Currently, there appears to be no reason, either theoretical or experimental, why VHTS would be impossible, in spite of the 2006 prediction of the death of HTS by 2010-2015 through the so-called scientometric analysis of the publication record of the previous 20 years. The recent discovery of the new class of Fe-pnictide HTSs fuels more cautious optimism. Since its inception, BCS theory has provided the basic framework for the occurrence and understanding of superconductivity, but it has failed to show where and how to find superconductivity at a higher temperature. This may be attributed to the small energy scale of superconductivity in comparison with those of other excitations in the solids. After examining existing data, we believe that a holistic multidisciplinary enlightened empirical approach appears to be the most effective way to discover novel superconductors with higher transition temperatures. In this talk, I shall present several possible approaches toward VHTS that we are currently pursuing, after briefly summarizing what has happened in the long search for HTS and VHTS.