

# T<sub>c</sub>SUH Bi-Weekly Brown Bag Seminar

Texas Center for Superconductivity at the University of Houston

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## Room Temperature Superconductivity: The “Hole” Story

**Friday, July 22, 2005**

Room 102, University of Houston Science Center  
12:00 Noon – 1:00 p.m.

### Abstract

By recognizing the vital importance of two-hole Cooper pairs in addition to the standard two-electron ones in a many-electron system, the concept of pairing has been re-examined with striking conclusions. Based on this, Bose-Einstein condensation (BEC) theory is generalized to include not boson-boson interactions (also neglected in BCS theory) but rather boson-fermion interaction vertices reminiscent of the Fröhlich electron-phonon interaction. Instead of phonons, the bosons in the generalized BEC theory are now both particle and hole Cooper pairs, and it reduces to all the old known statistical theories as special cases—including the so-called “BCS-Bose crossover” picture, which in turn generalizes BCS theory. With no adjustable parameters, the generalized BEC theory yields substantially higher transition temperatures (including room-temperature superconductivity) without invoking non-phonon dynamics.

### Bio

Prof. Manuel de Llano received his B.S. from Fordham University, NYC, and his M.S. and Ph.D. from Catholic University of America. He has published a textbook, *Mecánica Cuántica* (now in its second edition) and over 200 research papers [including with G. A. Baker, Jr. (Los Alamos), H. Feshbach (MIT), E. H. Lieb (Princeton) and V. V. Tolmachev (Moscow)]. He has supervised 36 theses (7 doctoral, 17 masters and 12 undergraduate). He is a co-founder of the *International Workshops in Condensed-Matter Theories*, held annually since 1977.

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