



**SPEAKER:** Paul C. W. Chu (Department of Physics and Texas Center for Superconductivity, Univ. of Houston)

**TITLE:** **“A Long March to Room Temperature Superconductivity”**

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## ABSTRACT

In the last 29 years, great progress has been made in all areas of high temperature superconductivity (HTS) research from raising the transition temperature  $T_c$  and discovering new HTS compounds to developing theoretical models of HTS and fabricating and testing HTS prototype devices. For example, the  $T_c$  has been increased to 164 K in cuprate  $\text{HgBa}_2\text{Ca}_2\text{Cu}_3\text{O}_x$  under 30 GPa in 1993 at Houston, more than 200 HTS compounds have been found, numerous theoretical models have been developed, and many HTS prototype devices have been tested to display superior performance to that of their non-superconducting counterparts. The strong electron-phonon interaction required for the high  $T_c$  observed has been considered to be able to induce catastrophic structure collapse before high  $T_c$  can be realized, and a novel magnetism-based interaction in different forms has thus been proposed for high  $T_c$ . However, room temperature superconductivity is still elusive and a comprehensive microscopic theory of HTS remains to be achieved. The recent yet-to-be-confirmed report of conventional superconductivity of 190 K in  $\text{H}_2\text{S}$  at 200 GPa at Mainz with an unusual isotope effect poses serious challenges to our current understanding of HTS and may offer new insights into the origin of HTS. For instance, the absence of magnetism in  $\text{H}_2\text{S}$  indicates that strong electron correlation may not be crucial in the occurrence of its high  $T_c$  and that strong electron-phonon interaction associated with the low isotopic mass of H may be the cause of its superconductivity, as was originally proposed by Ashcroft back in 1964 for HTS in metallic hydrogen. Phonons might play an important although not the only role in high temperature superconductivity. Can the above imply the opening of a new revenue to room temperature superconductivity? In this presentation, I shall review the development of HTS in past decades and discuss recent results and their implications for room temperature superconductivity.