Why Do We Want Superconductivity at Higher Temperature, and How Do We Achieve It?

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Rick Smalley, the 1998 Nobel Laureate in Chemistry, listed in 2003 humanity's top ten challenges in the next 50 years with energy topping the list. Indeed, if we can solve our energy problem by having plentiful clean energy and use it intelligently, the rest of the challenges will evaporate. Superconductivity can make possible efficient generation, transmission, storage and use of energy efficient when perfected. To raise the superconducting transition temperature (Tc) to room temperature is the holy grail in superconductivity research. Its realization will no doubt lead to a new industrial revolution for the betterment of mankind.

The lure of superconductivity has never diminished ever since its discovery for more than 100 years – an extremely rare case in science. It has posed great challenges to scientists and offered vast promises to technologists. In fact, to raise the Tc from its current record of 164 K has been one major activity in superconductivity research. Given the complexity of the physics and material problem of high Tc superconductivity, finding new compounds empirically and realizing new mechanism guided theoretically may prove to be most fruitful in such an endeavor.

In this presentation, I shall briefly review the past and current search for superconductors with higher Tc.