Superconductivity has been discovered somehow unexpectedly in Hg with a critical temperature of $T_c = 4.15$ K by Kammerlingh Onnes. Superconductivity is essentially quantum mechanical phenomenon due to a Bose-Einstein condensation. Therefore, much attention has been paid to the superconductivity from the theoretical and experimental points of view. However, its essential weak point is its low $T_c$. Actually, it has long been believed that the realization of the “room temperature superconductor” is only a science fiction. In the early stage of superconductive material investigations, A15-type superconductors, such as Nb$_3$Sn, V$_3$Ga, Nb$_3$(Al,Ge) and Nb$_3$Ge, have been found by B.T. Matthias and his collaborators. The superconductors discovered in this stage are called “BCS superconductors” because their behavior can be well explained within the framework of the BCS theory.

However, the discovery of Cu-oxide superconductors in 1986 required a new theoretical interpretation with a new key concept. The important point is that $T_c$ is raised up to 138 K at ambient pressure, which is far above the highest $T_c$ record of 23 K in Nb$_3$Ge (Fig.1). With the high-$T_c$ record being broken one after another in Cu-oxides, one of the most challenging questions in superconductivity has become “how much will $T_c$ increases in non Cu-oxide superconductors? Within this background, we reported superconductivity at 39 K in MgB$_2$ in 2001, which is the highest $T_c$ among intermetallic superconductors and the $T_c$ is nearly twice compared to previously reported. Although MgB$_2$ is a well-known popular material, its high $T_c$ superconductivity ($T_c = 39$ K) had been hidden for about 50 years until our discovery. Recently, however, Fe-pnictide superconductor has been discovered by Hosono group, and $T_c$ reached to 55K.

In this situation, the most challenging question is that how much $T_c$ will be increased? I categorize the superconductors into three groups, depending on its $T_c$: Matsu ($T_c > 160$ K), Také ($160$ K $> T_c > 77$ K) and Umé ($T_c < 77$ K). No superconductor belongs to Matsu group at present stage, and only Cu-oxide superconductors belong to Také and all other superconductors belong to Umé. Our next target is to find the Také group superconductors, not belonging to Cu-oxide. In this annual meeting, I will talk the past and present status and future prospect of high-$T_c$ superconductivity.

![Fig.1: Chronology of $T_c$](image-url)