

# FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

**Project Title:** Every Element a Superconductor

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## 1. Background of research

Superconductivity is an ultimate physical phenomenon of zero resistance at low temperature and new discoveries of superconductors have attracted us with great impact in academic and industry. However, it is still unknown what kind material become superconductor and can be used practically at the room temperature. Theoretically hydrogen – atomic number 1 could be the room-temperature superconductor at very high pressure, but no experimental verification was performed. These are 100-years problems since the discovery of superconductivity.

## 2. Research objectives

To make every element a superconductor, search for the superconducting state at the high-pressure state of elements (including hydrogen) in which the superconducting has not been discovered.

## 3. Research characteristics (incl. originality and creativity)

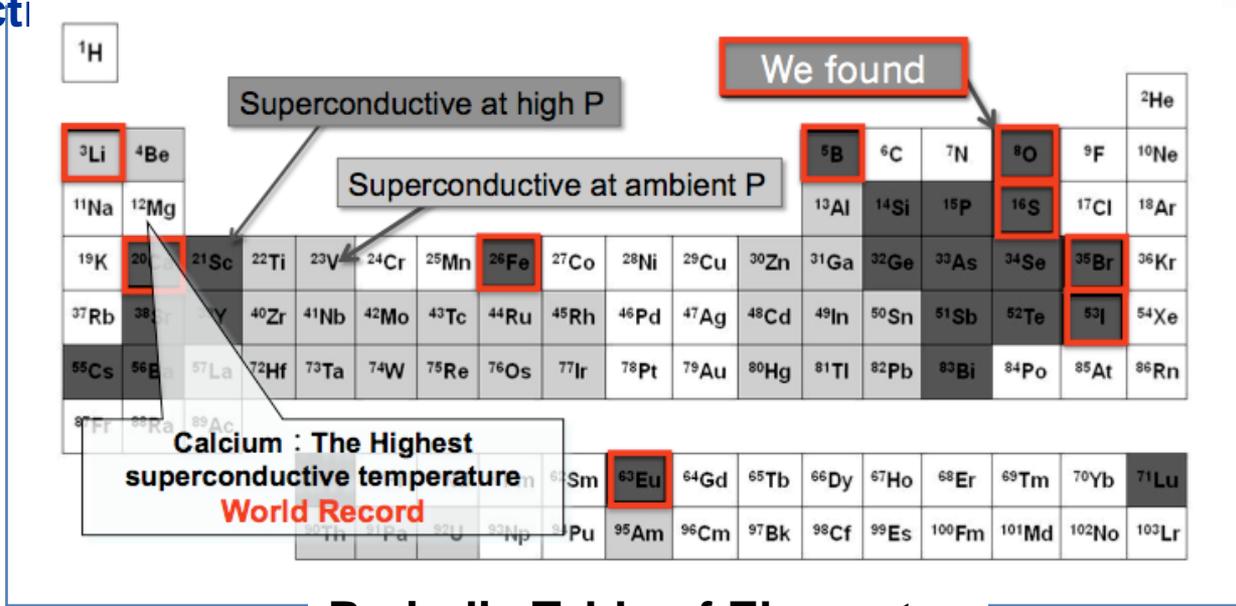
The high-pressure technology is one of a technique that can access to undiscovered character of materials, and has discovered many of superconductors. Universality and possibility of “superconductivity” that is an ultimate physical phenomenon are studied for “element” that is an elementary material unit by using the high-pressure technology.

## 4. Anticipated effects and future applications of research

The data of superconducting element lead not only an important improvement of known superconductors but a development of new superconductors, which is applied to the development of electronic devices and the solution of energy problems. Especially, an ultimate green innovation can be expected if the room temperature superconducting is achieved.

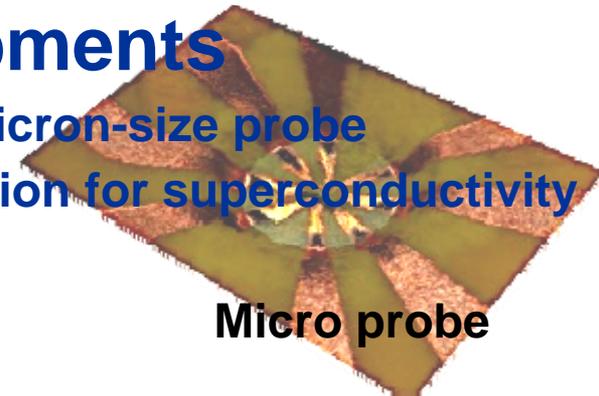
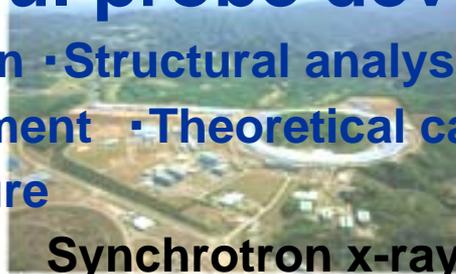
# Objectives: Make every element a superconductor

- No superconductive elements can be superconductive under pressure.
- Half number of elements is superconductor. Hydrogen also superconductive



## Plan: Generation of unrevealed pressure condition and powerful probe developments

- 300-GPa generation
- Structural analysis
- micron-size probe
- Purification of element
- Theoretical calculation for superconductivity at very high pressure



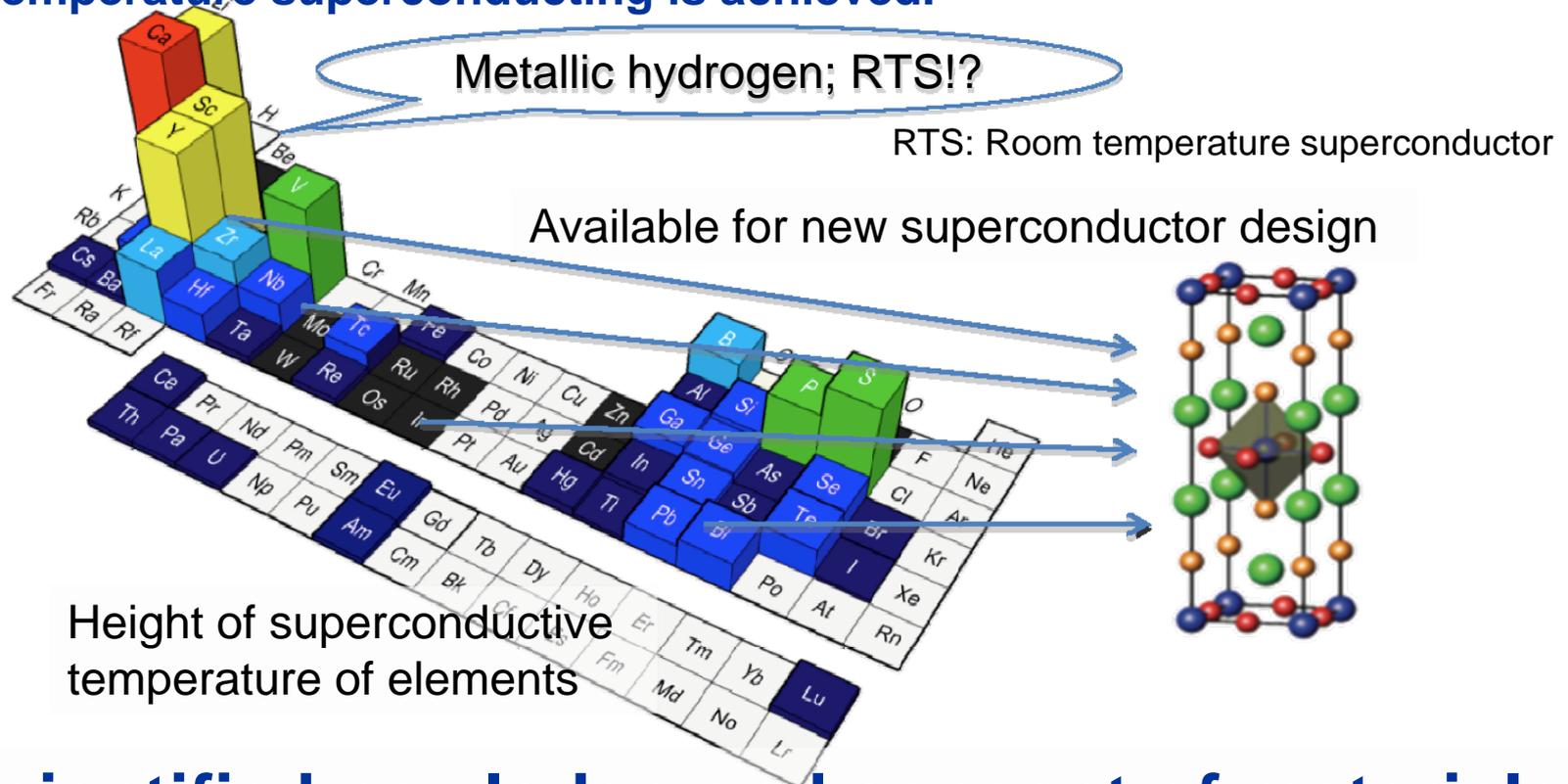
High-pressure device

Synchrotron x-ray

Micro probe

# Anticipated effects and future applications

- Important improvement of known superconductors and development of new superconductors. Application of developments of electronic devices and the solution of energy problems.
- Especially, an ultimate green innovation can be expected if the room temperature superconducting is achieved.



## New scientific knowledge and concept of materials

- New material properties should be hidden behind unexplored condition.
- Familiar element superconductors attract people.