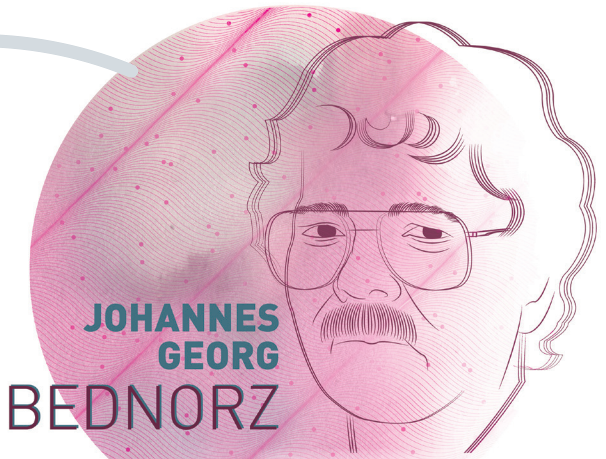
SUPERCONDUCTIVITY

THE RESEARCHERS



JOHANNES GEORG BEDNORZ

- German physicist, born in 1950.
- He studied mineralogy.
- In 1983, he started, with Karl Alexander Muller a study about electrical features of ceramics. The ceramics used were formed from oxides of transition metals. In 1986, they produced the first example of superconductivity with a barium-lanthanum-copper oxide cooled at 35K.

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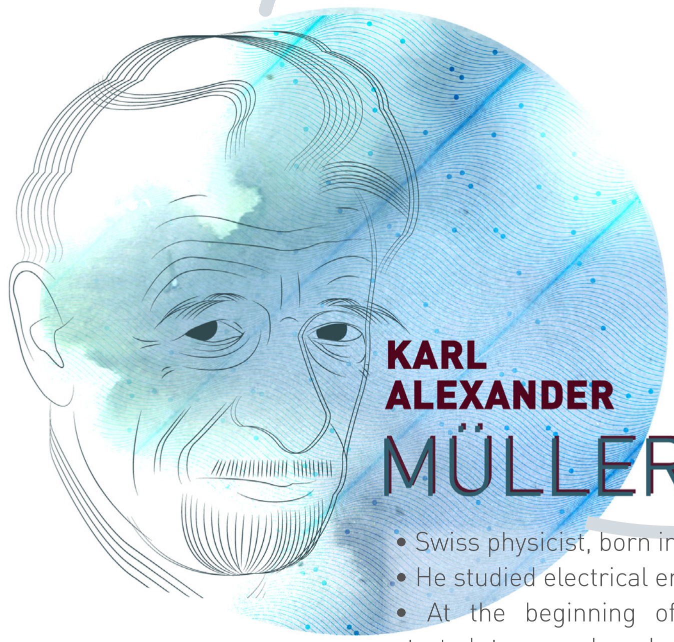
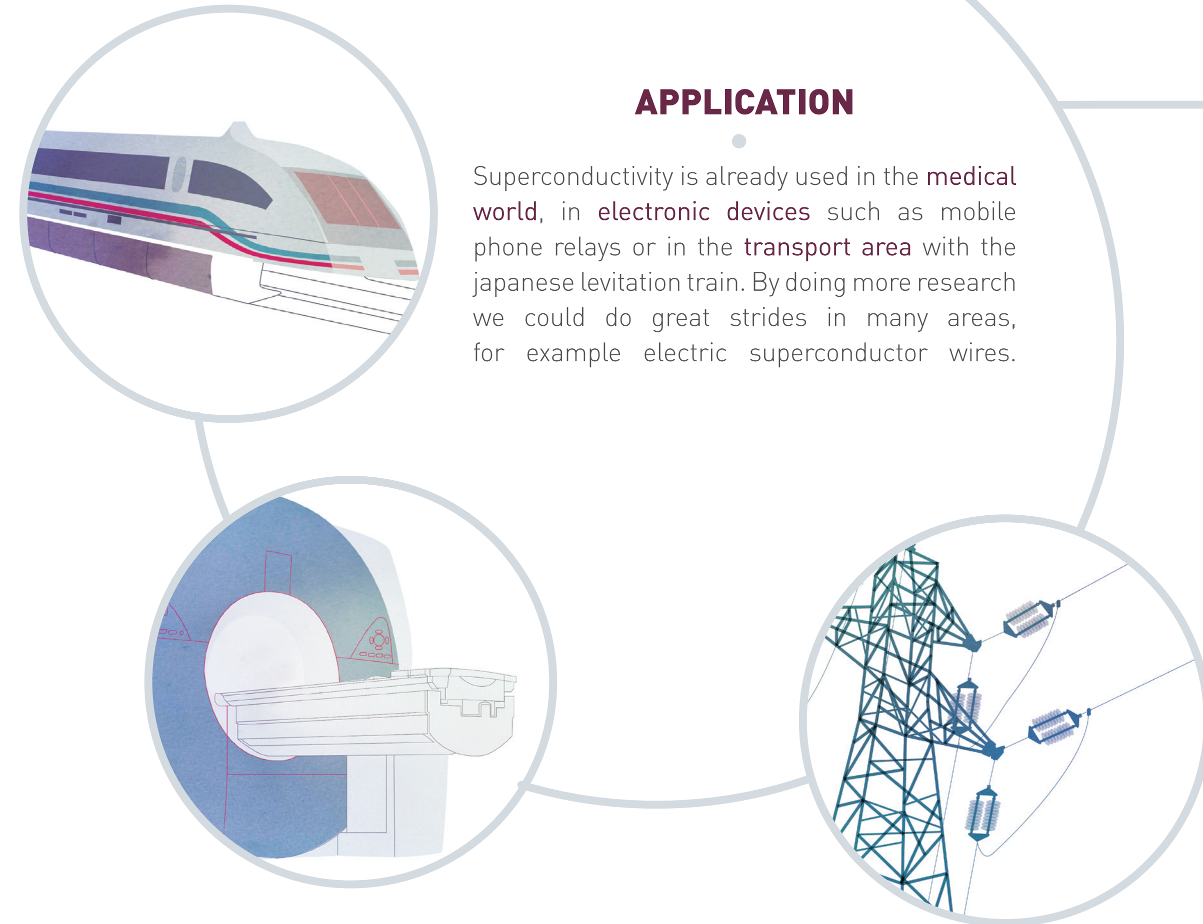


KARL ALEXANDER MÜLLER

- Swiss physicist, born in 1927.
- He studied electrical engineering.
- At the beginning of the eighties, Müller started to search substances which become superconducting at high temperatures. The coldest temperature known was 23K. In 1983, he hires Johannes Georg Bednorz to help him to test oxides.

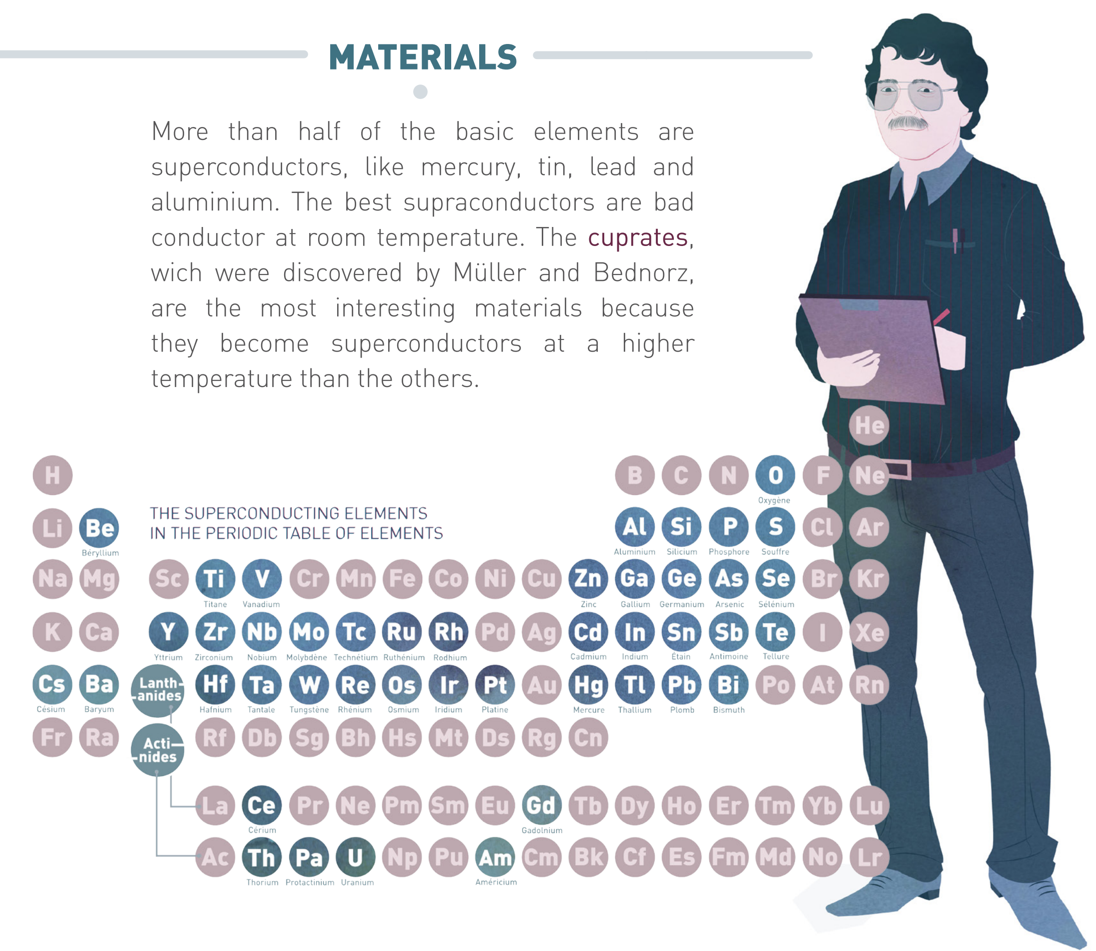
APPLICATION



Superconductivity is already used in the medical world, in electronic devices such as mobile phone relays or in the transport area with the japanese levitation train. By doing more research we could do great strides in many areas, for example electric superconductor wires.

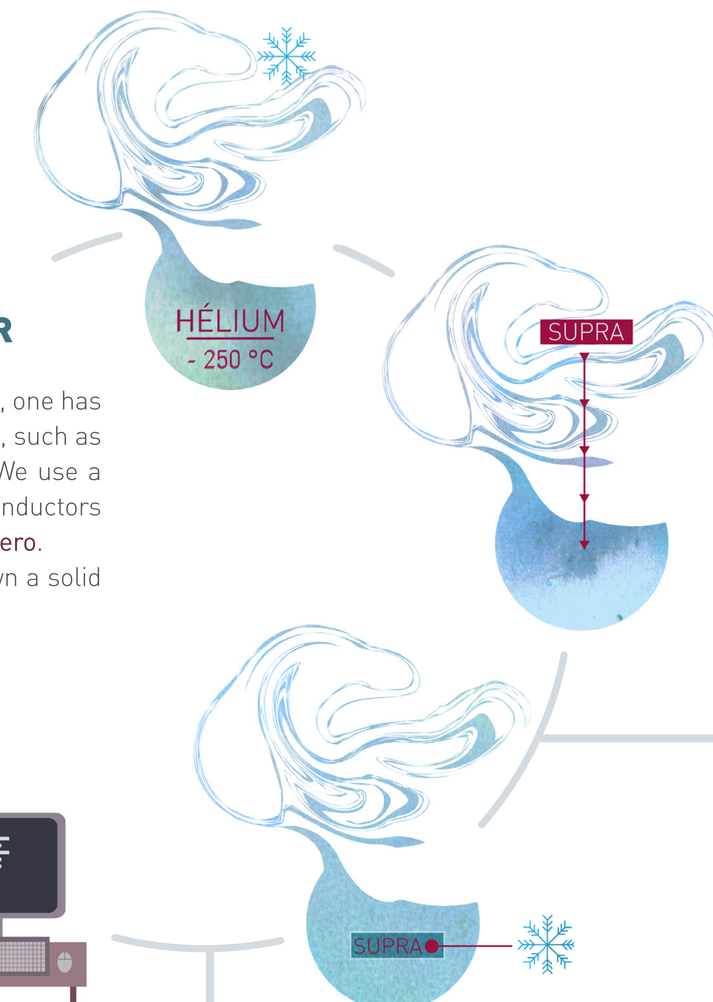
MATERIALS

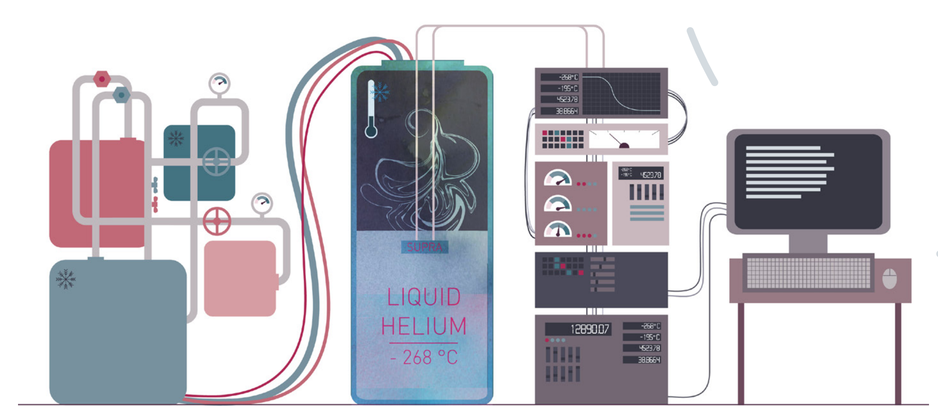
More than half of the basic elements are superconductors, like mercury, tin, lead and aluminium. The best supraconductors are bad conductor at room temperature. The cuprates, wich were discovered by Müller and Bednorz, are the most interesting materials because they become superconductors at a higher temperature than the others.



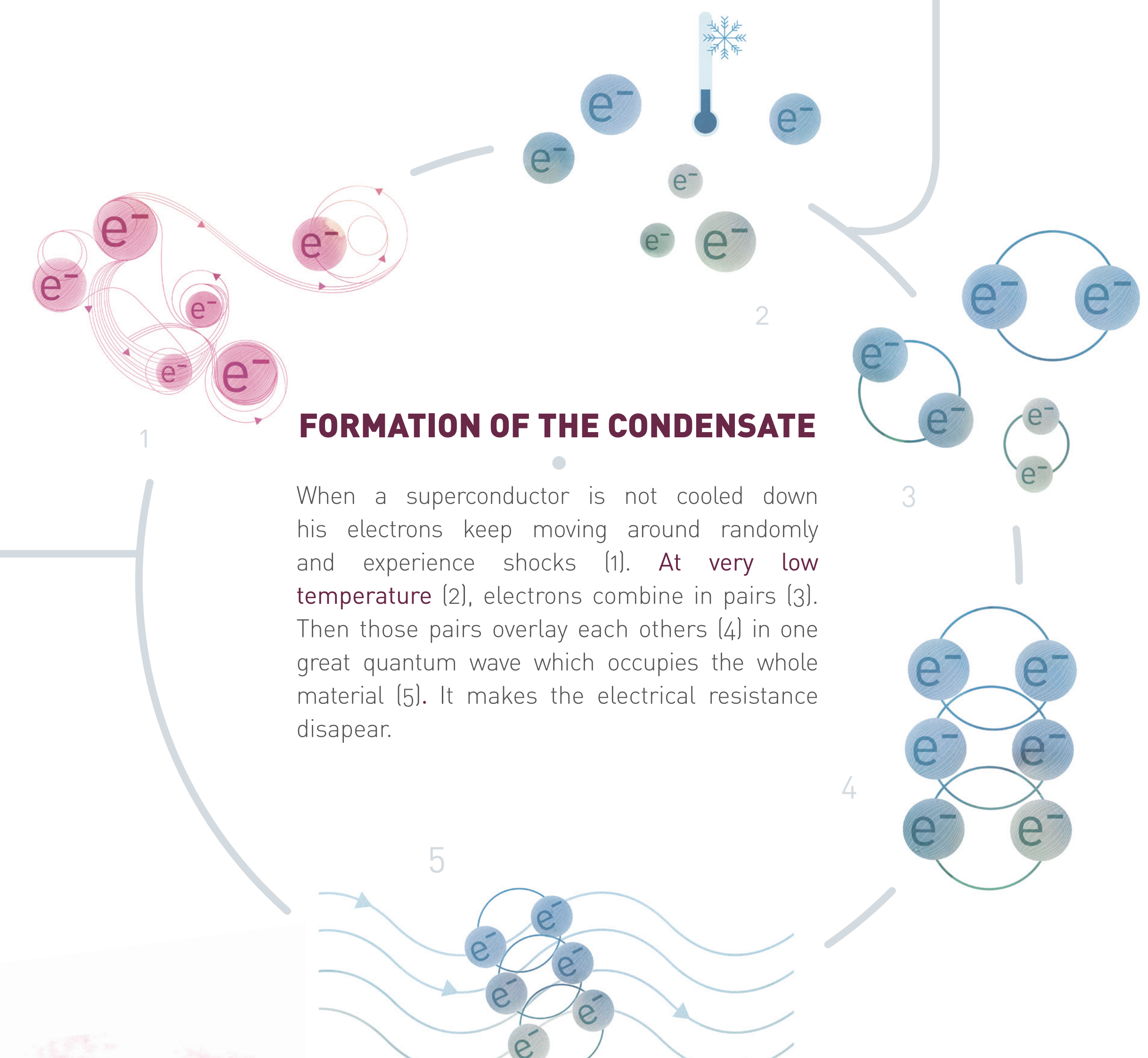
HOW TO COOL A SUPERCONDUCTOR

To cool a superconductor material, one has to immerse it in a cryogenic liquid, such as liquid nitrogen or liquid Helium. We use a special fridge which cools superconductors a few degrees from the absolute zero. That's the easiest way to cool down a solid at very low temperatures.

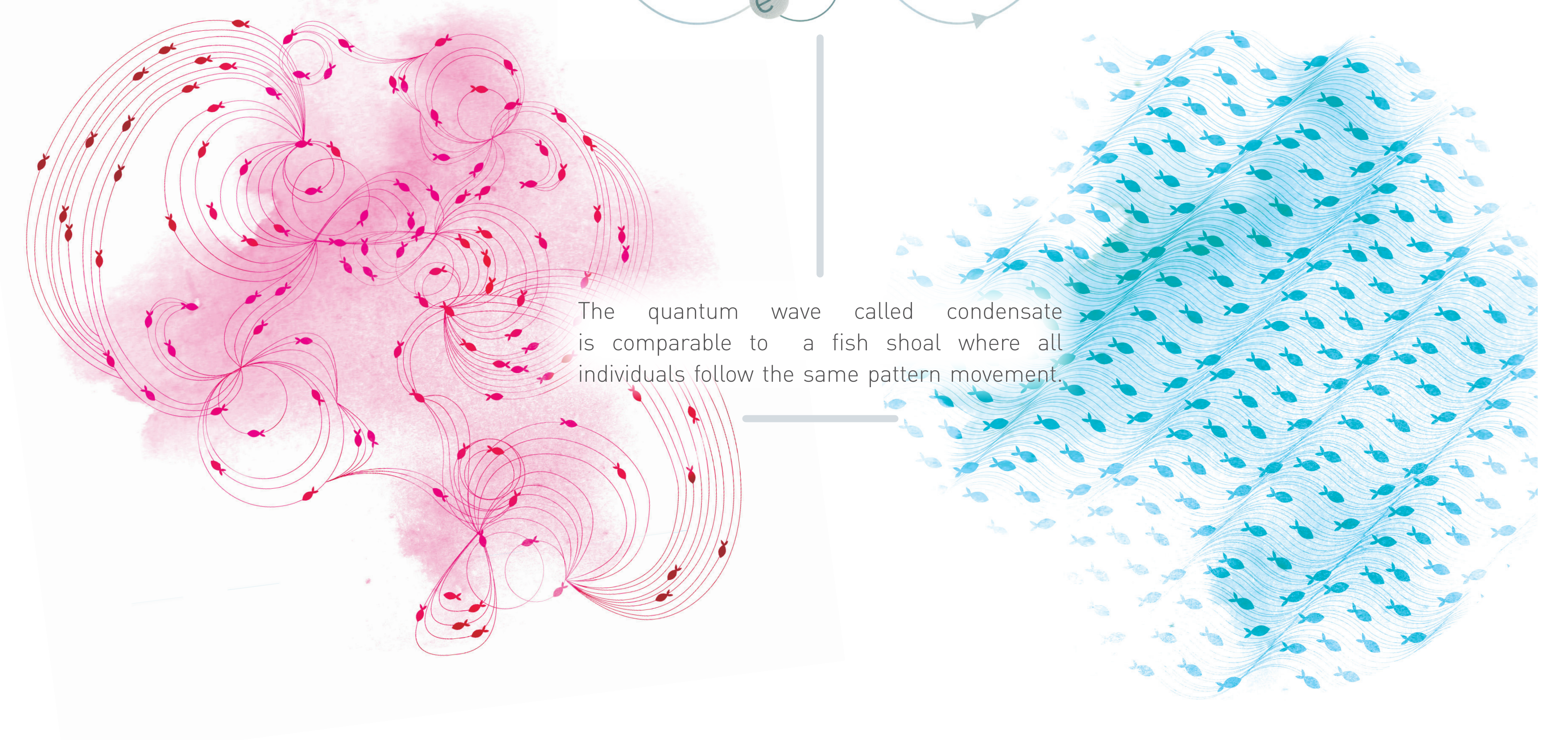




FORMATION OF THE CONDENSATE



When a superconductor is not cooled down his electrons keep moving around randomly and experience shocks [1]. At very low temperature [2], electrons combine in pairs [3]. Then those pairs overlay each others [4] in one great quantum wave which occupies the whole material [5]. It makes the electrical resistance disapear.



The quantum wave called condensate is comparable to a fish shoal where all individuals follow the same pattern movement.

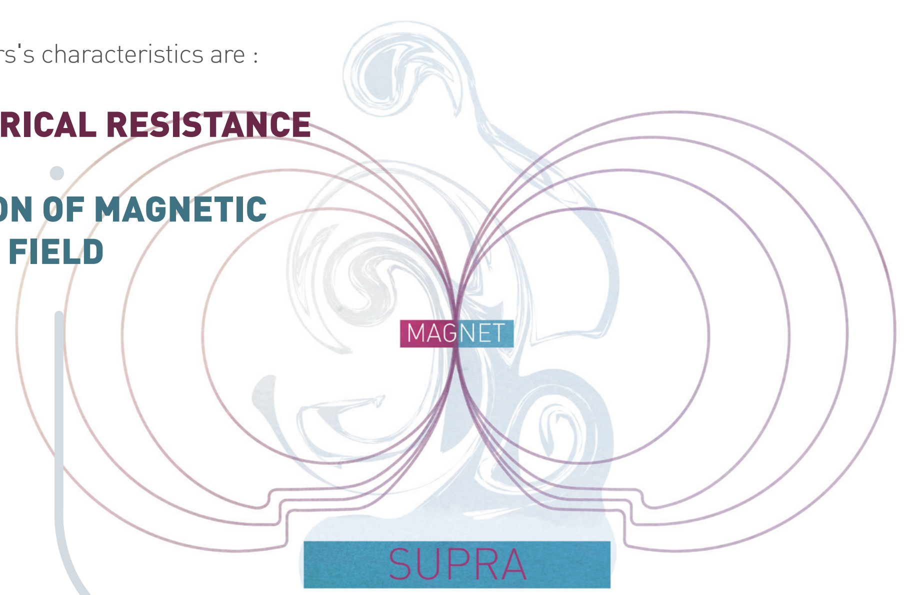
Magnetic and electrical properties of some materials change at very low temperature. We call theses materials:

SUPERCONDUCTORS

The superconductors's characteristics are :

ZERO ELECTRICAL RESISTANCE

EXPULSION OF MAGNETIC FIELD

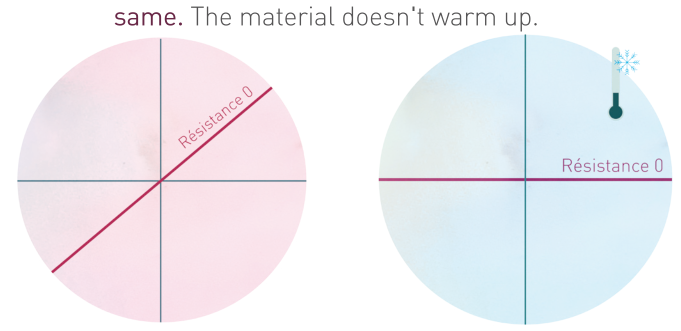


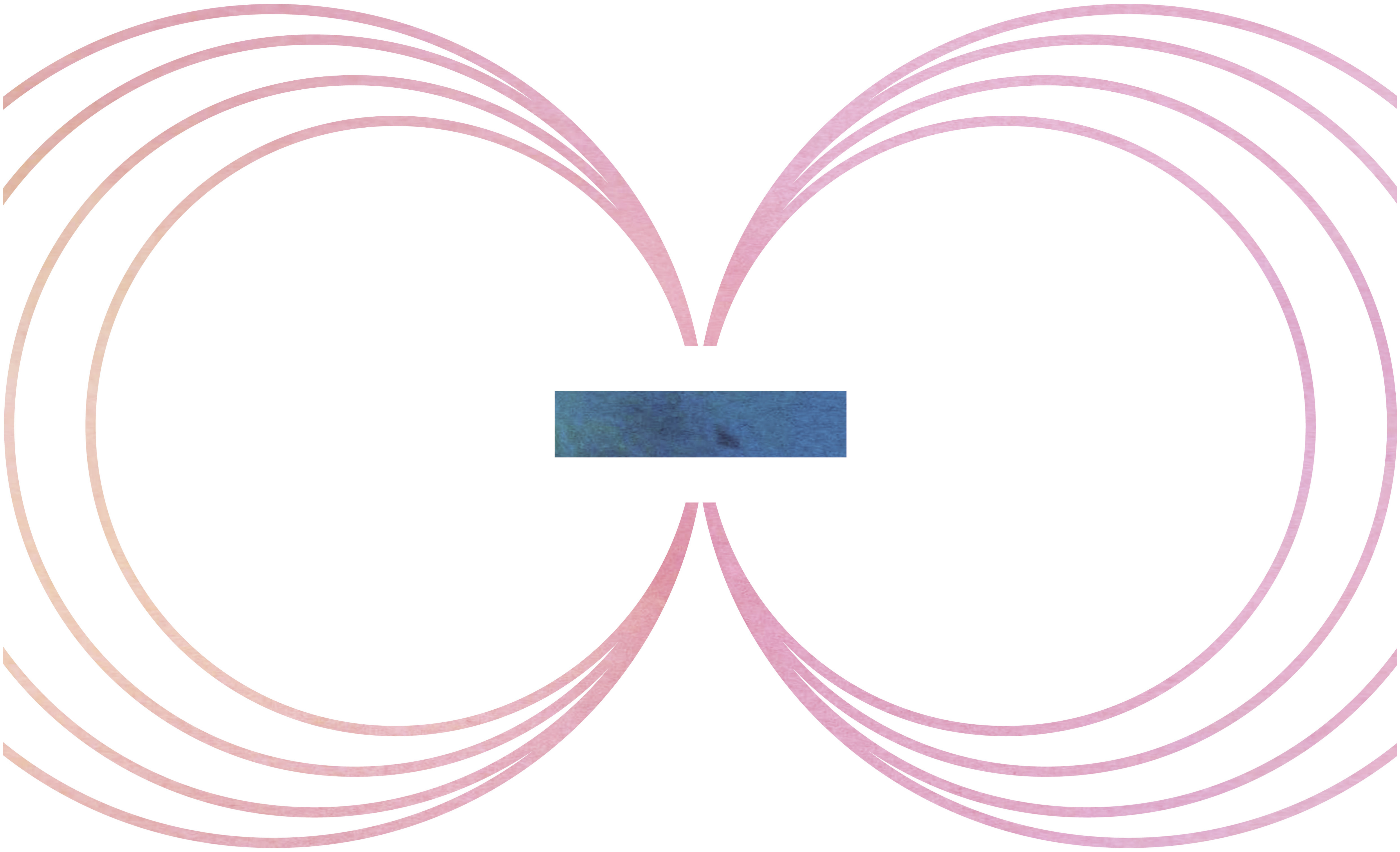
EXPULSION OF THE MAGNETIC FIELD

The expulsion of magnetic field enables the levitation.

ZERO ELECTRICAL RESISTANCE

A superconductor material is a perfect electrical conductor. When an electric current passes through a superconductor, it doesn't suffer any resistance and its power stays the same. The material doesn't warm up.





NOBEL PRIZE

-1987-

SUPER CONDUCTIVITY