Uses of superconductors

Superconductors are used in the following applications:

- Maglev (magnetic levitation) trains. These work because a superconductor repels a magnetic field so a magnet will float above a superconductor – this virtually eliminates the friction between the train and the track. However, there are safety concerns about the strong magnetic fields used as these could be a risk to human health.
- Large hadron collider or particle accelerator. This use of superconductors was developed at the Rutherford Appleton Laboratory in Oxfordshire, UK in the 1960s. The latest and biggest large hadron collider is currently being built in Switzerland by a coalition of scientific organisations from several countries. Superconductors are used to make extremely powerful electromagnets to accelerate charged particles very fast (to near the speed of light).
- SQUIDs (**S**uperconducting **QU**antum **I**nterference **D**evices) are used to detect even the weakest magnetic field. They are used in mine detection equipment to help in the removal of land mines.
- The USA is developing "E-bombs". These are devices that make use of strong, superconductor-derived magnetic fields to create a fast, high-intensity electromagnetic pulse that can disable an enemy's electronic equipment. These devices were first used in wartime in March 2003 when USA forces attacked an Iraqi broadcast facility. They can release two billion watts of energy at once.

The following uses of superconductors are under development:

- Making electricity generation more efficient
- Very fast computing.

Other impacts of superconductors on technology will depend on either finding superconductors that work at far higher temperatures than those known at present, or finding cheaper ways of achieving the very cold temperatures currently needed to make them work.

Blue skies research

Scientific research that does not have a particular commercial aim in view is called blue skies research. Many discoveries are made 'by chance' when scientists are trying to find out something else. The discovery of superconductivity was made nearly 100 years ago but technological applications have really only become available in the last 10 years or so.

Think about the following questions and discuss them with others:

- Is it important that blue skies research is carried out?
- Who should fund it?
- Why is it important that scientists record all their observations – even ones which do not fit the pattern they were expecting?
- Do you know of any scientific developments that were made by chance – maybe when the researchers concerned were looking for something else?