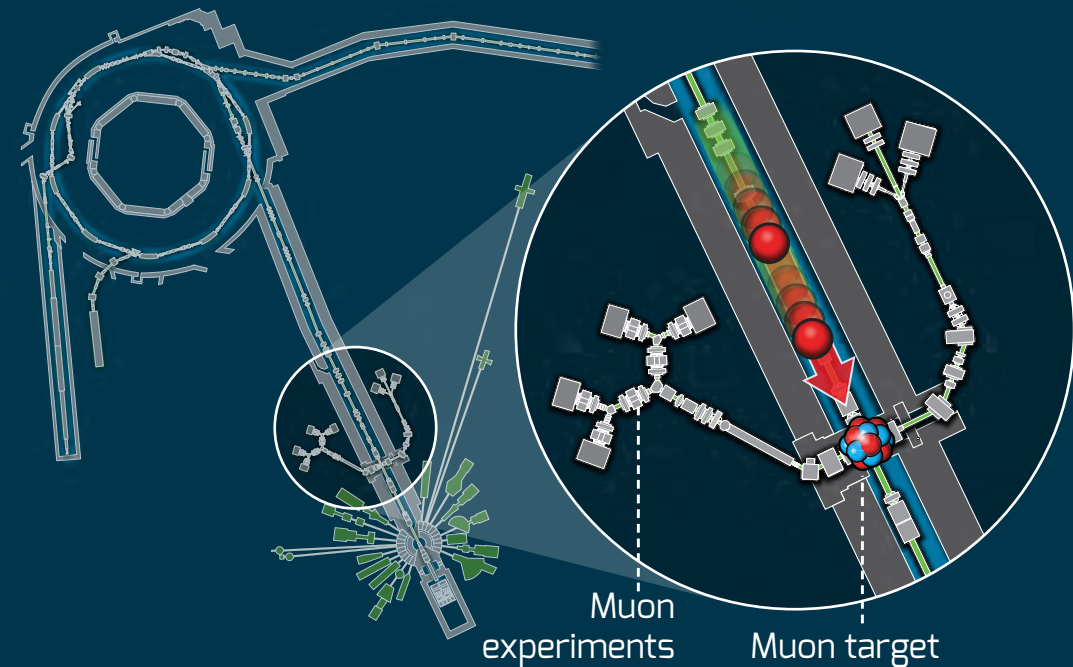


HOW ISIS MAKES MUONS

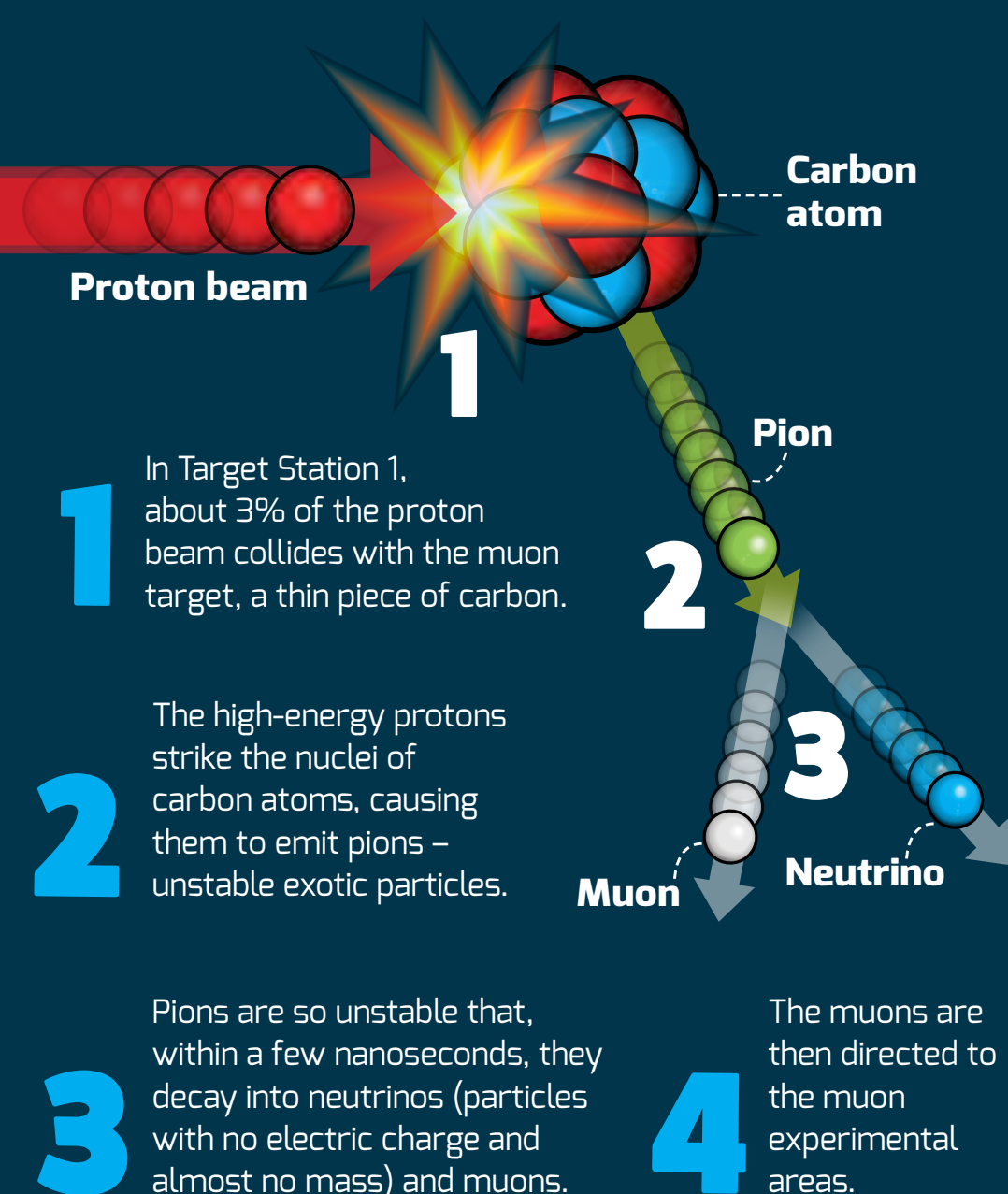


What is a Muon?

Muons are exotic relatives of electrons, but with more mass. They are unstable particles that quickly decay into an electron, or positron, and two neutrinos, but they live long enough to be used in experiments.

Why use muons?

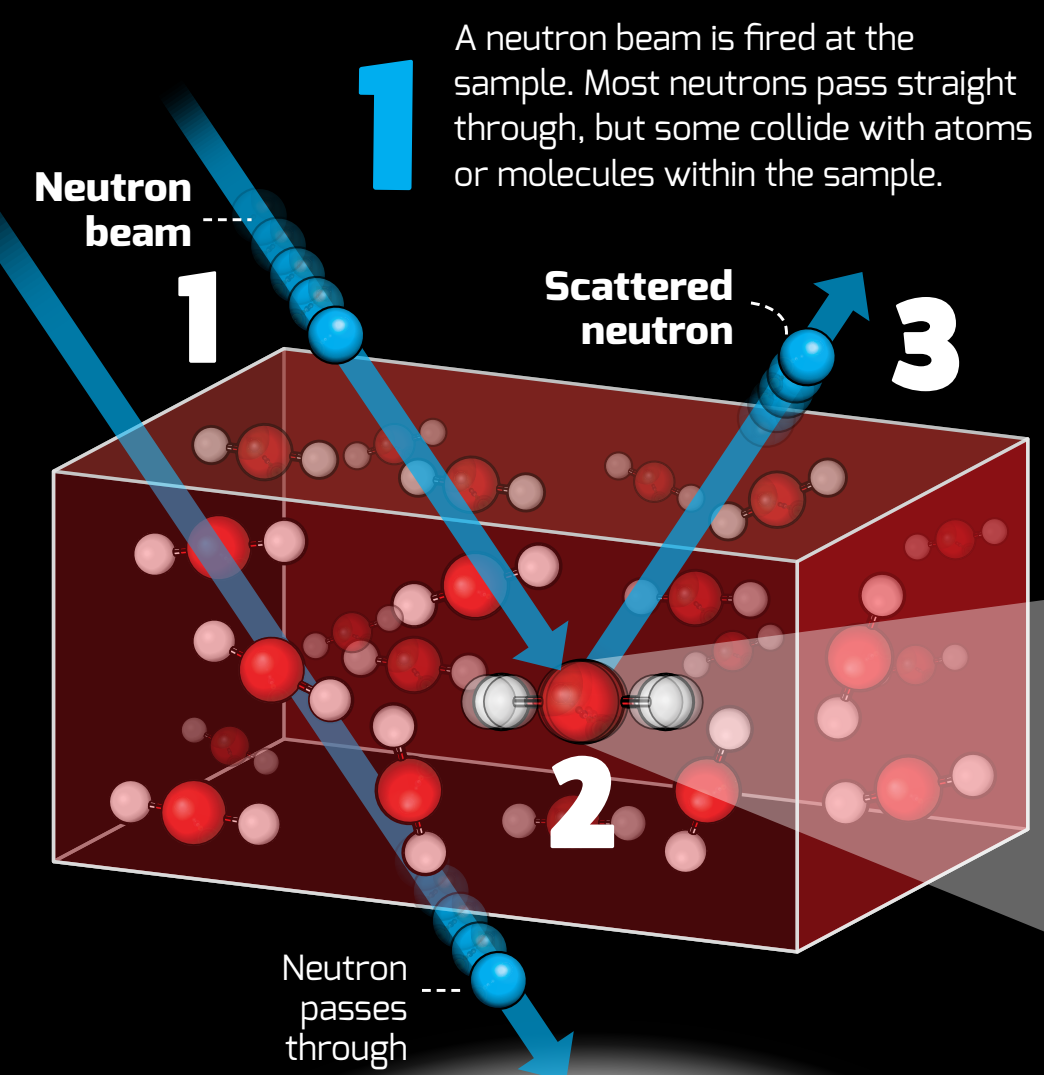
Muons carry an electric charge and have a property called 'spin' that makes them very sensitive to magnetic fields. They can be used to study magnetic materials, battery materials and superconductors. They can also be used to study the composition of archaeological and historical artefacts.



Muons only live for 2 millionths of a second before they decay into lighter particles.

How neutrons probe matter

NEUTRON SPECTROSCOPY



Neutron spectroscopy measures the change in energy of a neutron when it scatters off a sample. This allows us to understand how atoms and molecules in the sample are moving and the forces acting between them. It can be used to explore diverse materials and processes, from molecular vibrations and rotations to electronic interactions and quantum tunnelling.

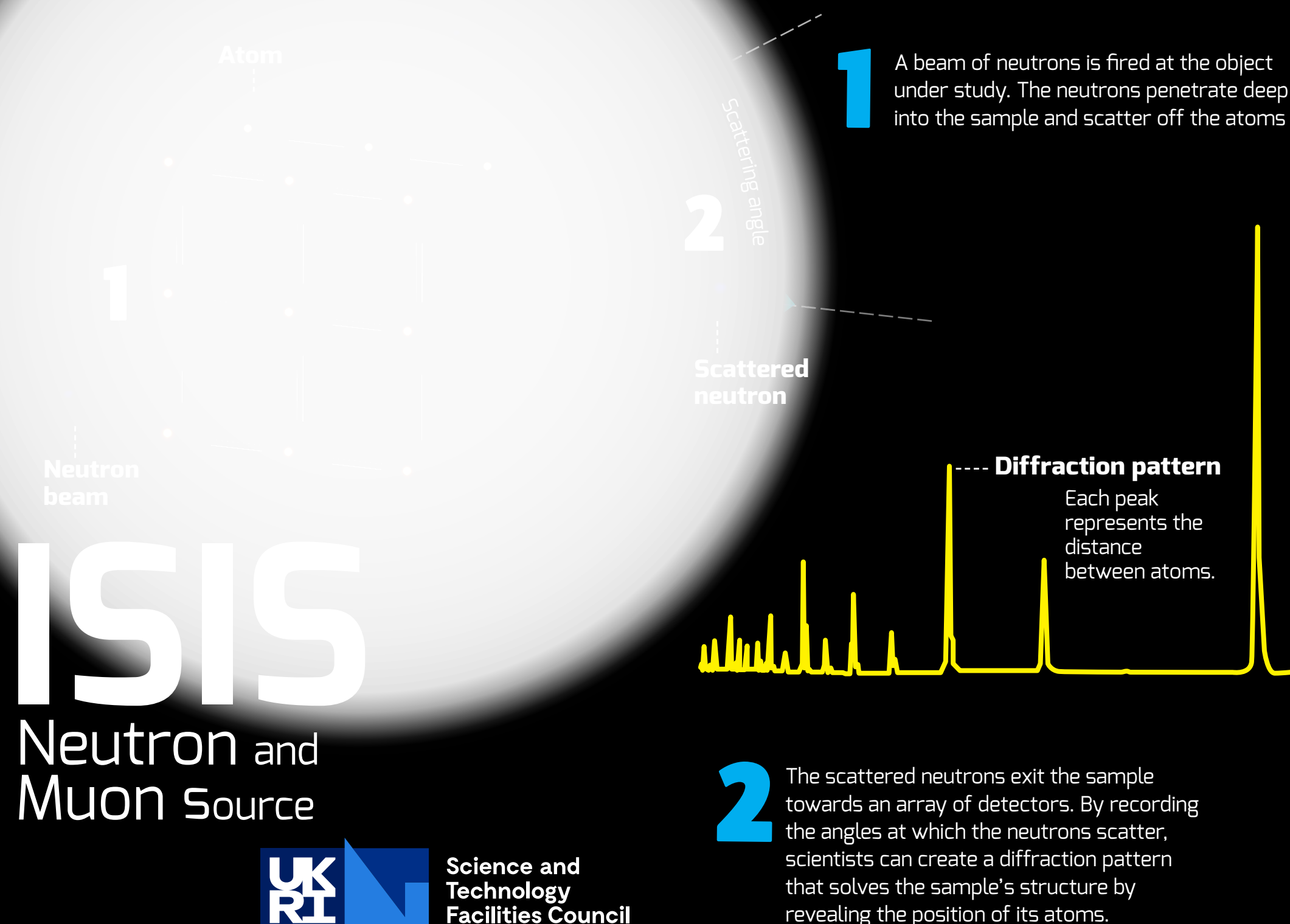
2 The neutron excites the molecule and causes it to vibrate. This changes the energy of the neutron.

3 When the scattered neutron exits the sample, it has a different energy than when it entered. From the change in energy scientists can study the chemical and physical properties of the molecule it scattered from.

NEUTRON DIFFRACTION

Neutron diffraction reveals the locations of atoms in materials and can be used to explore atomic, molecular and magnetic structure.

It can be used to investigate a wide range of materials and how they work, such as battery materials in mobile phones, magnetic materials in computer hard drives, molecules in cell membranes or soaps in cleaning products.



ISIS

Neutron and Muon Source

How muons probe matter

MUON SPECTROSCOPY

