



Muon Impact Brochure and Ray Diagram

The Neutron Science Fan Diagram



Neutron Science Impact Brochure



A world of knowledge

2

Neutron scattering research impacts on much of modern life...

Energy

Energy created from burning fossil fuels has underpinned the major industrialisation of the modern world over the last 200 years. As we become more concerned with climate change and the security of our energy supply, the desire to harness other forms of energy from solar, wind, wave, hydrogen and nuclear becomes more pressing. Hydrogen is one of the most promising fuels for the future. Research programmes to discover lightweight materials that can efficiently and safely store and transport hydrogen rely heavily on neutron scattering.

Radiant solar cells based on plastics instead of silicon offer the potential to cheaply cover wide areas of land and harness the abundant energy from the sun.

Engineering studies of components from nuclear power stations allow operating lifetimes to be confidently extended.

→ SEE PAGE 4

Environment and climate

In recent times, we have become acutely aware of the value of a clean and safe environment for healthy living, and the sensitivity of the climate to activity on Earth.

Neutron scattering is being used to help scientists understand the impact of pollution, work towards solutions for reducing or removing carbon dioxide from the atmosphere and industrial processes, and make more efficient use of natural resources.

Taking a molecular view of the world allows the motor industry to design lubricants and fuel additives that are kinder to the environment and to use lightweight alloys to improve fuel efficiency.

→ SEE PAGE 6

Medicine and health

Bioceria glass, artificial hips and gels for use in cleft palate surgery have all benefited from knowledge gained from neutron scattering. Multi-disciplinary teams of medics, physicists, materials scientists, chemists and engineers come together at research centres like ISIS and the ILL to make key breakthroughs in using materials in medicine.

The ability of neutron scattering to accurately determine molecular structures allows the behaviour of proteins, enzymes and cell membranes to be understood. Interactions of pharmaceuticals with biological molecules can be studied and compared with computer simulations, improving the chances of finding drugs to treat life-changing conditions such as Alzheimer's.

→ SEE PAGE 8

Muon



Energy Environment Functional Materials



Batteries
Hydrogen Economy
Solar cells
Muon Catalysed Fusion

Waste Heat
Photochemistry

Solar Devices
Vacancy Kinetics
Alloy Hardness
Composition studies

Conduction Mechanisms
Photo excited Spin relaxation

hydrogen dissociation
muon trapping
Non-destructive elemental analysis

Ionic motion
Muon implantation
Nuclear physics

Cultural Heritage

Electronics / IT

Alloying Techniques
Composition Studies
Depth profiling

Semiconductors
Cosmic Interference

Negative muons
X-ray emission
non-destructive elemental Analysis

Spin transport
Impurity effects
Single event upsets (SEUs)

Chemistry

Bioscience

Physical and fundamental Science

Radicals
Catalysis
Vibrational States
Reaction Kinetics

Antioxidants
Bio-electronics
Molecular Dynamics

Magnetic Phenomena
Superconductivity
Quantum Phenomena

Radical structure and dynamics
Spin repolarisation

Radical formation/ Reaction kinetics
Ion Conduction
Electron transfer

Spin ordering
Spin dynamics
Magnetic frustration
Flux penetration
Atomic physics

hyperfine coupling constants
Radio-frequency methods

- **Introduction**
- **Timeline**
- **Skills**

Muon



Energy Environment Functional Materials

Batteries

Hydrogen Economy
Solar cells
Muon Catalysed Fusion

Ionic motion
Muon implantation
Nuclear physics

Environment

Waste Heat
Photochemistry

Conduction Mechanisms
Photo excited Spin relaxation

Functional Materials

Solar Devices
Vacancy Kinetics
Alloy Hardness

Composition studies

hydrogen dissociation
muon trapping
Non-destructive elemental analysis

Cultural Heritage

Alloying Techniques
Composition Studies
Depth profiling

Negative muons
X-ray emission
non-destructive elemental Analysis

Electronics / IT

Semiconductors
Cosmic Interference

Spin transport
Impurity effects
Single event upsets (SEUs)

Chemistry

Radicals
Catalysis
Vibrational States
Reaction Kinetics

Radical structure and dynamics
Spin repolarisation
hyperfine coupling constants
Radio-frequency methods

Bioscience

Antioxidants
Molecular Dynamics
Bio-electronics

Radical formation/
Reaction kinetics
Ion Conduction
Electron transfer

Physical and fundamental Science

Magnetic Phenomena
Superconductivity
Quantum Phenomena

Spin ordering
Spin dynamics
Magnetic frustration
Flux penetration
Atomic physics

- Introduction
- Timeline
- Skills
- Case Studies
- Quotes

The Proposed Muon Ray Diagram

