EARIV

41 of the world's most advanced characterisation facilities

open for industry

European Analytical Research Infrastructures Village

European **A**nalytical **R**esearch **I**nfrastructures **V**illage (EARIV)

Research - Analysis - Innovation
For industry, Europe-wide

EARIV allows industry to quickly and easily connect with relevant experts and exploit the most appropriate, state-of-the-art tools.

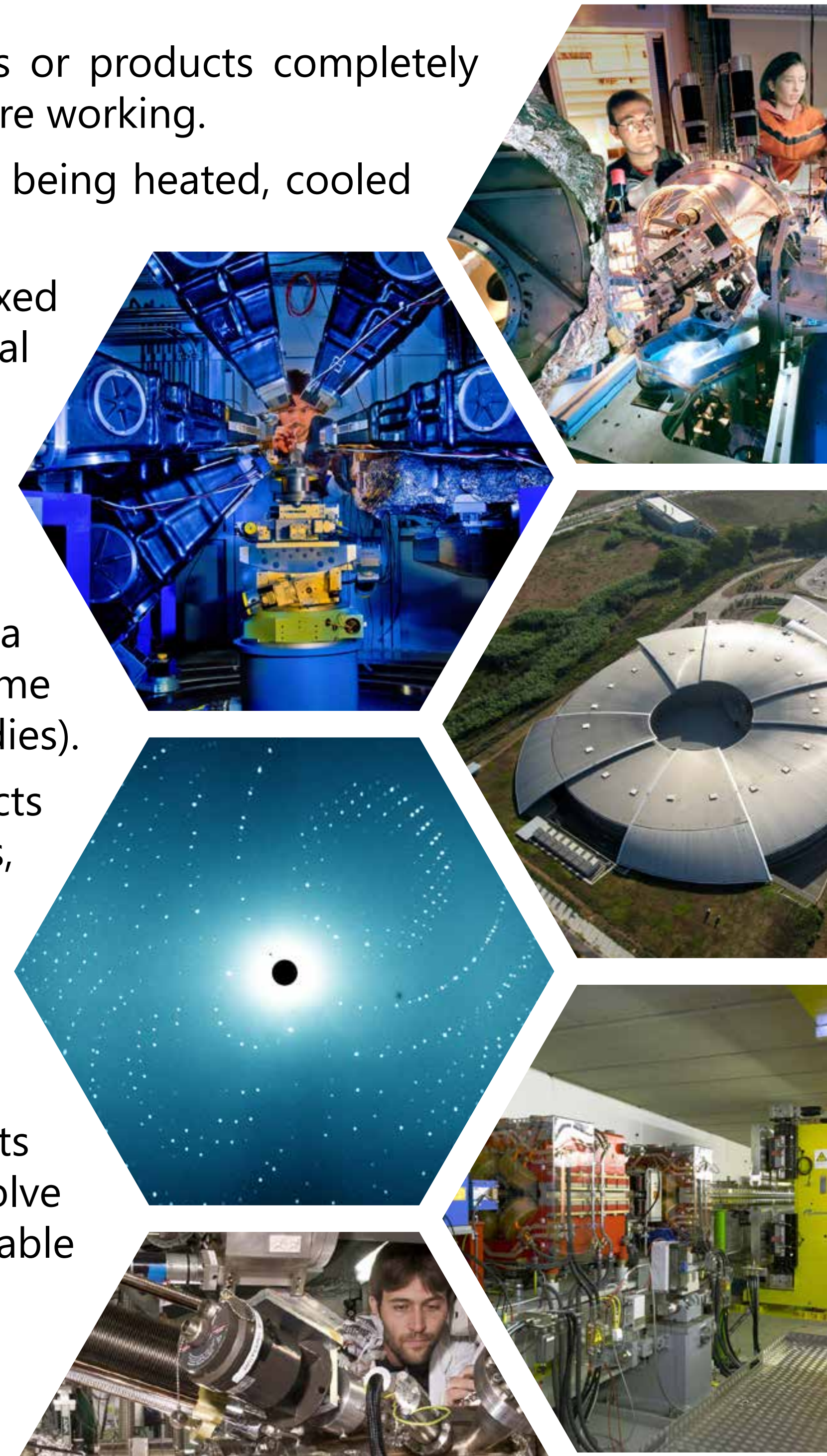
It is a joint initiative led by a set of transnational *Horizon 2020* projects and regional initiatives that promotes opportunities for industry to engage with European large-scale analytical research infrastructures (ARIs).

What are ARIs and what can they do?

The EARIV network is made up of 41 of the world's most advanced analytical research infrastructures (ARIs). These ARIs are large-scale research facilities at the cutting edge of scientific discovery and advanced characterisation. Each ARI hosts unique instruments and expertise.

The suite of instruments available at ARIs go far beyond the capabilities of conventional characterisation techniques - resolving smaller features, faster phenomena and being more sensitive. They can probe deep inside materials and devices under real operating conditions.

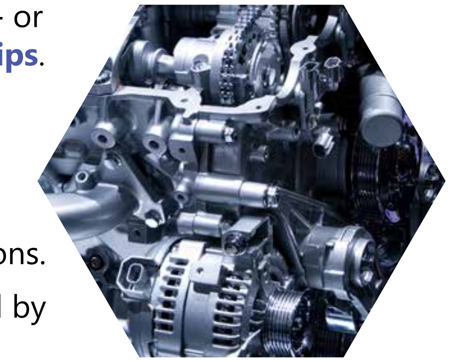
- Characterising inside materials or products completely non-destructively whilst they are working.
- Studying materials as they are being heated, cooled or deformed.
- Studying liquids being mixed in situ and tracking chemical reactions.
- Characterising materials at atomic-, nano-, and micro-scopic lengthscales.
- Studying dynamic phenomena from milli- to femto-second time resolutions (time-resolved studies).
- Imaging structures and defects hidden deep within materials, and without damaging them.



ARIs are ideal for supporting pre-competitive and commercial R&D. They provide unique insights into existing products, help resolve technical uncertainties and enable innovation.

Automotive, Aeronautics & Space

- **Non-destructively mapping stresses** within real components (both new and used).
- Studying **surface treatments** and **coatings**, including 'before and after' studies on the same sample.
- Non-destructive radiography and computed tomography to locate **organic materials, water, hydrogen and lithium**, even when buried within several centimetres of metal.
- Investigating the atomic- and micro-structure of **metals, alloys, glasses, ceramics, semiconductors, composites, metal foams** and **nanomaterials**.
- Quantifying **residual stresses** in cast metal components in order to optimise manufacturing conditions and **evaluate new alloys**.
- Non-destructive **quality-control testing** to detect hidden defects and other manufacturing anomalies.
- **High-speed imaging** of car engine parts in **running engines**, including visualising **water** and **oil flow,** in situ.
- Analysing **tyre composition** and **formulations**.
- Characterising materials (e.g. plastics, composites, fabrics, metals and alloys) to **improve performance, safety** and **comfort**.
- Tracking material changes during **deformation** (from milli- to pico- or femto-second timescales) to reveal **structure-property relationships**.
- In situ **fatigue testing** to understand **failure mechanisms**.
- Imaging **ash deposits** in automotive **engines** and diesel **filters**.
- Tracking **combustion and catalytic processes in situ** (both structural and chemical), under standard catalyst operating conditions.
- **Damage threshold determination** of optical components induced by ultrafast laser pulses (LIDT).



Examples

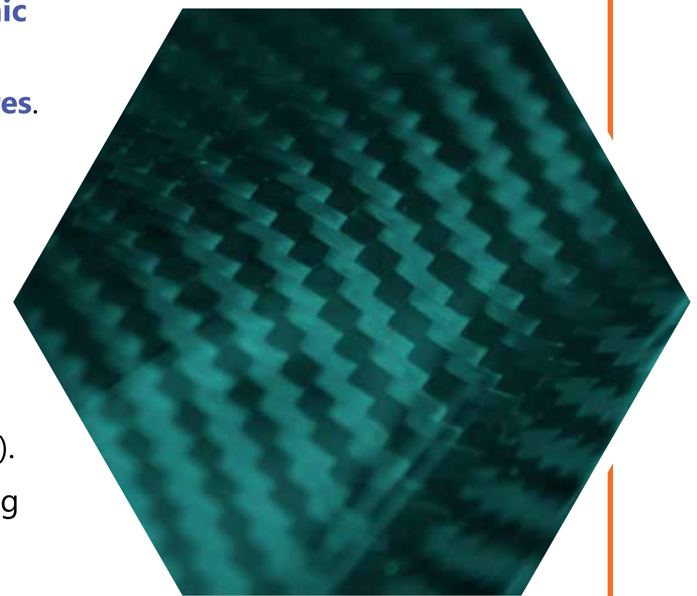
A leading car manufacturer used high-energy X-ray and neutron diffraction to non-destructively map residual stresses in a new type of aluminium alloy that has been developed for automotive applications. The data obtained from the mapping experiment has been used to validate and improve models of how these stresses form. This will ultimately allow engineers to design safer and longer-lasting components and materials.

Approximately 800 pyrotechnic parts for the Ariane 5 rocket programme passed through a neutron imaging quality control process. This non-destructive technique is sensitive to light elements, such as hydrogen-rich explosives, which in this case allowed the explosive filling inside the aluminium components to be checked.

Researchers from a leading car manufacturer, in collaboration with a UK university, used fast computed X-ray micro-tomography to continually image expanded polypropylene (EPP) foams during compression. Such foams are used in car bumpers and headrests due to their energy-absorption properties. The tomography results were used to construct a computer model predicting EPP deformation behaviour which can be used to optimise the amount of EPP used in vehicles.

Advanced Materials & Nanotechnology

- Characterising materials in terms of their **chemistry**, **structure** and/or **electronic/magnetic properties**.
- Nanostructural characterisation of **high-performance polymers** and **polymer fibres** (e.g. skin-core studies).
- Tracking **material changes under simulated production conditions** (in situ), or at **extreme pressures and temperatures**.
- Investigating **structural changes** in situ as a function of **stress** and/or changing **environmental conditions**.
- Investigating **failure mechanisms** in composite materials and stress-transfer in fibre-reinforced composites during **in situ deformation**.
- Characterising the structure and composition of **nanoparticles**, and their fabrication.
- Characterising **spintronic** and **magneto-electronic** materials and devices.
- Visualising **magnetic domains** and **nanostructures**.
- **Chemical species** determination.
- Investigating **oxidation states** and **surface corrosion** under different agents and conditions.
- **Structure-property relationship** studies.
- Morphological and structural characterisation of **nanomaterials** using **3D imaging**.
- **Characterising thin layers** (roughness, interfaces).
- Studying **structural evolutions** in **ceramics** during synthesis and manufacturing processes.



Examples

Room-temperature superconductivity would eliminate many of the world's energy problems, offering lossless energy storage and distribution. Scientists have been studying superconductors using neutron and X-ray scattering to trace electron interactions and identify new magnetic behaviour. This knowledge could potentially be exploited to design new semiconducting materials that work at higher temperatures.

Self healing could greatly prolong the lifetime of steels exposed to high temperatures and stresses. Under these conditions, damage typically accumulates through the formation of creep cavities. Scientists used X-ray nanotomography to show that, for model alloys, healing can be achieved by autonomous gold precipitation. The experiments will help to transition such materials from model systems to real-world applications.

Crossed nanowire structures are used in nano-devices. The intersections of the nanowires play a critical role in creating hybrid architectures. Researchers used a hard X-ray nanoprobe to study point contacts between single crossed nanowires grown by thermal evaporation. The experimental technique opens new routes for the study of local structures with nanometre resolution.

Food, Agriculture & Consumer Products

- Investigating **freeze drying processes** for foods (in situ).
- Characterising the **impact** and **penetration** of **cosmetics** on the skin, lips, etc...
- Investigating the **dynamics** and **stability** of **food emulsions**.
- Studying **structural changes** in plastics used for **packaging** and **storage**.
- Understanding **crystallisation** and **phase processes** in food.
- Evaluating **toxic chemicals** in **foodstuffs**, and **speciation** in meat, fish, legumes and vegetables.
- Identifying **chemical elements** or **species** in foodstuffs to use as biomarkers for proving and/or verifying **origin claims** (e.g. products that are protected by one of the various EU schemes that guarantee geographical origin, or similar).
- Determining the content of **copper**, and other **metals**, in **wine** and **spirits** during manufacture.
- **Chemical imaging** of **plants**, **seeds**, **grains**, **algae**, etc...
- Characterising **polymer** and **metal** parts used in consumer goods to assess the impact of **stress**, **heat** and **humidity**.
- **Phase transitions** in **fat** and **rheological activity** in carbohydrate food.
- **Non-destructive studies** on the **degradation** of materials used in consumer products.
- Identifying **low-level chemical toxins** in plants, microorganisms, and animal tissues, and determining their **distribution**.
- Monitoring **toxic concentrations** of heavy metals in **soil samples**.
- Speciation of **environmental pollutants**.

Examples

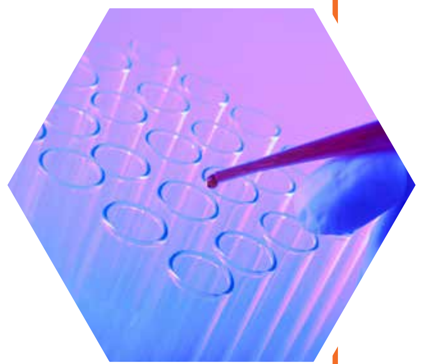
The European Union protects traditional specialities from specific geographical regions via a number of consumer-recognised designation schemes. Scientists used wide- and small-angle X-ray diffraction to study fat samples from Spanish and Italian cured ham products. Biomarkers were isolated that can be used to identify the country of origin. This knowledge allows the origin of cured hams to be verified to help prevent fraud.

Scientists from a leading consumer product manufacturer used small-angle X-ray scattering to study microstructural changes in hair conditioners over a three month period. Their experiments provided the scientists with a mechanistic understanding of how the microstructure evolves from when it leaves the factory until used by consumers.

Most dehydrated fruits and vegetables are produced by air drying, but higher quality products can be obtained using more expensive freeze-drying methods. Scientists from a leading consumer product manufacturer used X-ray micro-computed tomography to quantitatively assess the impact of freeze-drying, blanching and various pre-treatments on the microstructure and rehydration properties of winter carrots. The results revealed the relationship between freezing rate and product quality.

Chemistry & Catalysis

- Characterising **dispersions**, **emulsions**, **partially ordered materials**, **detergents**, **surfactants** and **colloidal solutions**.
- In situ **qualitative** and **quantitative** measurements during **catalysis**, at millisecond time resolutions and across wide concentration ranges.
- Characterising the **morphology of surfaces**, **thin films** and **interfaces** (e.g. roughness, thickness, composition etc...), including liquid/liquid, liquid/solid, liquid/air and solid/air.
- Studying the core and/or shell of **micelles** under various conditions (e.g. **temperature, shear, concentration** etc...), including in situ studies of **surfactant molecular interactions**.
- Studying **chemical reactions** and **industrial processes** at the atomic level under both **dynamic** and **steady state** conditions, and also probing **reaction intermediates**.
- Interactions between **particles** and other substances (e.g. **pollutants**, **polymers**, etc...).
- Determining the **distribution** and **dimensions** of particles and pores.
- Studying the **rheological properties** of liquids to help optimise their **viscosity** for specific manufacturing, cooling and lubrication applications.
- Identifying and characterising **chemical contaminants**.
- **Nanoscale characterisation** of the shape, size and density of **molecular aggregates**.
- Obtaining information about **chemical bonds**.
- Analysing the **shape**, **size** and **density** of nanoparticles and catalyst particles, and phase distributions in catalyst pellets.



Examples

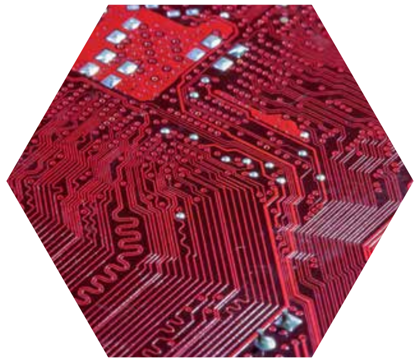
Industrial chemists from an Italian company regularly use inelastic neutron scattering to characterise the surface chemistry of complex materials containing activated carbons. This technique allows the vibrational spectra of the hydrogenous species in carbons to be observed. This kind of measurement can reveal new opportunities to optimise the design of support materials used in electro-catalysts.

Researchers from a leading car manufacturer used energy-dispersive X-ray absorption scattering and in situ transmission electron microscopy to study catalysis in a working vehicle exhaust system. The results revealed an oxidative redispersion of Pt nanoparticles during quick redox cycling that could potentially extend the lifetime of vehicle catalysts.

Researchers from a leading energy company, in collaboration with other partners, investigated Fischer-Tropsch catalyst pellets in action using a combination of X-ray diffraction-based computed tomography and pair distribution function computed tomography. The combination of techniques was used to unravel the complex Co nanoparticle phase evolution and provided the researchers with a complete understanding of structure-activity relationships in catalytic systems.

Energy & Electronics

- Investigating **hydrogen distribution** and flow inside **hydrogen storage tanks** and characterising **hydrogen storage media**.
- Compositional and micro-structural characterisation of **rechargeable batteries**, their materials and their **degradation mechanisms**.
- Investigating **new battery materials** and components inside **functioning battery cells** (e.g. electrodes, electrolytes, membranes and thin films).
- **Non-destructive stress-mapping** of wind turbine components, visualising internal defects in wind turbine blades and **evaluating blade coatings**.
- **Characterising** organic, inorganic and hybrid **photovoltaic materials** (e.g. cell crystal structure, ionic migration, metallic impurities etc...).
- Investigating **microstructural changes** in **photovoltaic materials** with ageing and during radiation exposure.
- Visualising **electrolyte filling strategies** for the improvement of industrial processes.
- Tracking **lithium ion exchange** in working lithium ion batteries during **charge/discharge** cycles.
- Imaging water flow in **running hydrogen** and **electrolysis cells**.
- Studying conditions within **working fuel cell membranes** (e.g. hydration, oxidation/reduction and ageing processes).
- Characterising the crystal structure of **powders** and **mixed phases**.
- Evaluating the structure of **new magnetic materials** for use in electrical generators.
- **Radiation hardness testing** of materials and components, including those used in space applications.



Examples

Hydrogen fuel cells work by converting hydrogen and oxygen into water using catalytic electrodes separated by a polymer-membrane electrolyte. Researchers used small-angle neutron scattering to investigate variations in water content within the polymer membrane. They discovered that water content in the membrane does not directly correlate with water content in the surrounding channels. This information can be used to design fuel cells with better water management.

Researchers used high-speed X-ray imaging to study short-circuits in commercial lithium-ion batteries. By analysing the high-speed images, they were able to study the formation of gas pockets and venting, and they could identify consistent failure mechanisms. These new insights can be used to improve battery safety.

Integrated electrical circuits can sometimes delaminate during manufacture. Researchers used neutron and X-ray reflectometry to characterise the thickness, roughness and density of delaminated and non-delaminated wafers. They identified hydrogen accumulation as being responsible for the lack of adhesion between layers. This knowledge can be used to control (and eliminate) delamination during the manufacturing process.

Mining, Environment, Oil & Gas

- Studying **in situ phase transformations** in **geological samples** under **extremes** of **temperature** and **pressure**.
- Evaluating the **performance** and **ageing** of materials (e.g. metals and polymers) used for the storage and transport of **petroleum** and **petrochemical products**.
- Studying the structure and composition of **meteorites** and **interplanetary dust**.
- Mineral and rock **microstructural analysis** to help evaluate **new mining opportunities** and assess natural **oil** and **gas** reservoirs.
- Assessing **environmental contamination**, including **identifying** extremely **low concentrations** of elements associated with the **petrochemical** and **mining industries.**
- **Real-time imaging** of **water flow** in **geomaterials**, in **concrete** and for cooling applications in the nuclear industry.
- Characterising **zeolites** to improve oil catalytic cracking.
- **Phase** and **structure mapping** of **concrete mixtures** during **in situ** wetting.
- Studying **emulsions** to improve **oil transport**.
- Analysis of **trace elements** in **petroleum** and **petrochemical products**.
- Characterising **rock fossils** to improve the extraction of fossil fuels.
- **Elemental** and **speciation analysis** of crude oil.
- **Chemical characterisation** to improve **waste management**.
- Analysis of major components with **<1% uncertainty** and trace elements at **parts-per-billion** concentrations.

Examples

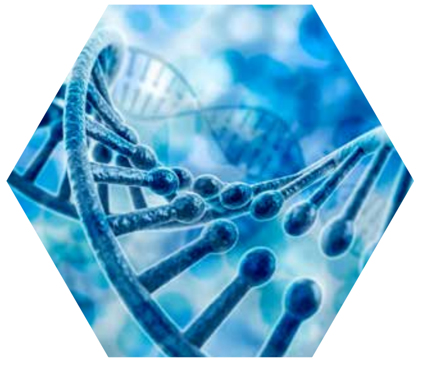
Large reserves of natural gas are held within an organic material called kerogen. Currently the gas can be extracted by hydraulic fracturing, but this is a controversial extraction technique. An international group of scientists studied different kerogen samples using X-ray scattering techniques. This allowed the scientists to develop molecular models of kerogen. These findings could open doors to improved extraction technologies.

Digital Rock Analysis is a technique for extracting nanometre- to centimetre-scale geological and petrophysical information from digitised rock samples. Researchers from a company specialising in digital rock analysis used X-ray nano-tomography to scan rock samples at a 280 nanometre voxel size. The acquired images provided a level of detail that cannot be achieved using lab-based CT, and can be used to create 3D rock models that predict rock properties with a high degree of confidence.

In its quest to reduce CO_2 emissions from aluminium production, a leading global mining group used neutron diffraction to observe the interactions of minerals and molten salts at high temperature (>800°C) over several hours. The industrial engineers are using the results to optimise their process parameters.

Pharmaceuticals

- **High-throughput** protein crystallography with automated systems for **drug discovery** and **drug optimisation** applications.
- Characterising **active pharmaceutical ingredients** and formulations under simulated manufacturing conditions (e.g. pressure, ball milling, etc...).
- Characterising the structure and function of **enzymes** for **drug development**, including the location and movement of hydrogen atoms.
- **In situ studies** investigating how **storage** and **transport** conditions impact drug lifetime (e.g. accelerated ageing, humidity, temperature, UV exposure etc...).
- Revealing structural information about how **drugs interact with therapeutic targets** at the atomic level.
- Structural and interaction studies of **colloid suspensions**, **micro-emulsions** and **micelles**.
- Characterising the mechanisms of **self-assembly** in solutions.
- Solving **solubility** and **stability** issues for drug development and manufacturing.
- Studying **aggregation** and **crystallisation** phenomena.
- Detecting **impurities**.
- Polymorphism studies for protecting **intellectual property** and **detecting patent infringement**.
- Determining **drug structure** at the atomic level, including **chirality**, **absolute configuration** and identifying **drug-molecule binding** sites.
- Monitoring the **penetration** of drugs and pharmaceutical formulations into **biological tissues** such as the skin.



Examples

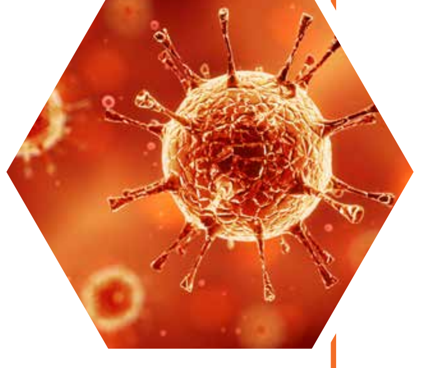
Neutron crystallography allows the location and movement of hydrogen atoms to be determined. It can therefore reveal opportunities to enhance drug-binding and reduce drug resistance. Researchers used neutron crystallography to study HIV-1, an enzyme essential for the replication of the HIV virus. It revealed why the enzyme's catalytic activity is pH sensitive which could help design new, more effective antiretroviral drugs.

AMPK (AMP-activated protein kinase) substrates are highly promising therapeutic drug targets for treating diabetes, cancer and ageing. Researchers at one of the world's foremost drug discovery companies successfully solved the structure of AMPK at a resolution of 2.9 Ångstroms. This was enough for the researchers to see detailed information about the chemical environment in the AMPK binding site.

Using full-field transmission microscopy, researchers could create a 3D image of an entire cell infected with the hepatitis C virus (HCV) under almost physiological conditions. This revealed how the HCV virus causes structural alterations in the cell and how specific antivirals repair the cell. Such tools are extremely valuable for checking drug effectiveness and allow complex biological processes to be better understood.

Medical & Biotechnology

- Measuring **residual stresses** in metal **prosthetic components** and **implants**.
- Evaluating the **impact** and **penetration** of medicinal ointments applied to the skin, lips, hair or nails, and as a **function of time**.
- Characterising healthy and diseased/degraded **bone microstructures** to help understand the underlying mechanisms (such as in osteoarthritis).
- Determining the **microstructure** of **biological tissue** (e.g. muscles, ligaments, tendons etc...) in both static and dynamic situations.
- Reconstructing **biological materials** and **individual cells** in 3D to help understand cellular mechanisms.
- Studying **scaffold materials** used for biological tissue regeneration.
- Investigating **fatigue** and ageing in **prosthetics** and **implants**.
- Imaging **medical devices in situ**, whilst operational.
- Tracking **metal pollutants** in tissues.
- Static and longitudinal **biomedical imaging** of tissue samples (tumour vascularisation networks etc...).
- Improving **radio-therapy** procedures.
- 3D/4D computed tomography (CT) imaging to study the **micro-** and **nano-structure** of **materials** and **devices**.
- Characterising **toothpaste**, **dental cements**, **resins** and **adhesives** for dental implants.
- Early **tumour diagnostics** using high-resolution imaging.
- Investigating how **nanoparticles** enter **biological cells**.
- Studying **drug delivery**, e.g. slow release implants and dissolution.



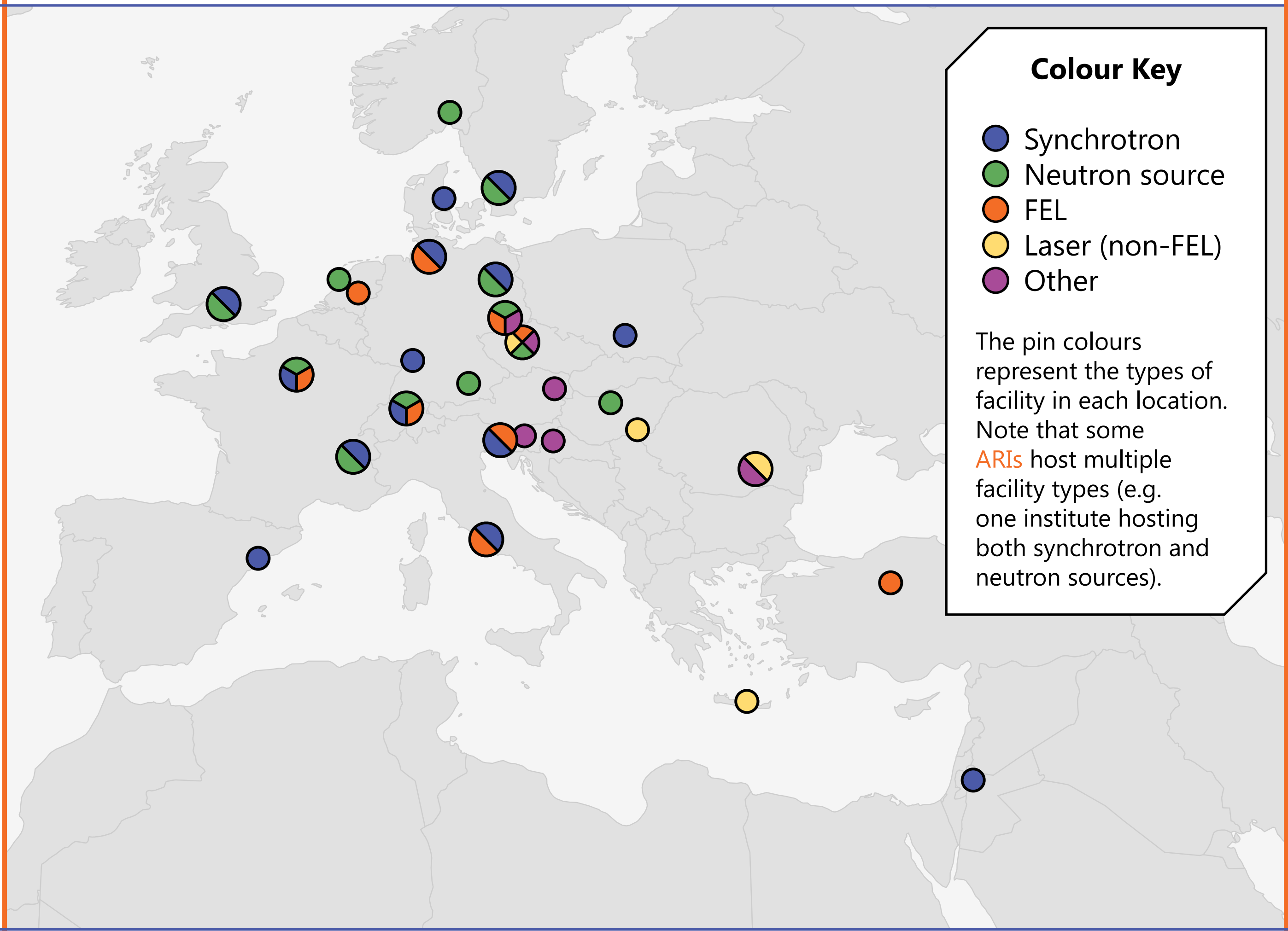
Examples

Inhalers are inefficient drug delivery vehicles as only 10-20% of the ejected drug is deposited in the user's lungs. Researchers from a company developing drug delivery devices studied inhalers using high-speed (MHz) phase contrast X-ray radiography to visualise the behaviour of the drug/propellant mixture inside the canister and actuator. The work has provided new insights into how inhalers can be made to be more efficient and the results could be used in the future to validate models.

Researchers have used time-resolved in situ small-angle X-ray scattering experiments to map the morphology of a tissue scaffold under static conditions, and whilst being deformed. The scaffold is made of a polymer which is as porous and as hard as bone. The results can help to improve the treatment of bone injuries and fractures.

A medical company used neutrons to study a hydrogel in a silicone interpenetrating polymer network (IPN). These materials can reduce hospital acquired infections by preventing biofilm formation and can also be used in drug delivery. The researchers used neutrons to characterise the structure of the IPN network, and were able to differentiate the signal of the hydrogel from that of the silicone using samples soaked in D_2O.

Where are the EARIV ARIs located?



CLIO — France — accueil.clio@u-psud.fr
old.clio.lcp.u-psud.fr/clio_eng/clio_eng.htm

European XFEL — Germany — contact@xfel.eu
www.xfel.eu

FLASH — Germany — innovation@desy.de
photon-science.desy.de/facilities/flash/index_eng.html

FERMI — Italy — info@elettra.eu
www.elettra.trieste.it/lightsources/fermi/fermi-machine/fermi-description.html

FELIX — the Netherlands — felix@science.ru.nl
www.ru.nl/felix

TARLA — Turkey — tel. +90 (312) 485 37 45
tarla.org.tr/facility/free-electron-laser

ELBE - Centre for High-power Radiation Sources — Germany — kontakt@hzdr.de
www.hzdr.de/elbe

ELI — Various (CZ, HU & RO) — industry@eli-laser.eu
www.eli-laser.eu

IESL-FORTH — Greece — liap@iesl.forth.gr
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NPL CANAM — Czech Republic — useroffice@ujf.cas.cz
canam.ujf.cas.cz/npl.html

ILL - European Neutron Source — France — industry@ill.eu
www.ill.eu/neutrons-for-society/industry-and-business

Laboratoire Léon Brillouin — France — llb-sec@cea.fr
www-llb.cea.fr/en/index.php

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www.helmholtz-berlin.de/quellen/ber/index_en.html

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www.bnc.hu

IFE — Norway — firmapost@ife.no
www.ife.no/en

ESS — Sweden — info@esss.se
europeanspallationsource.se

Reactor Institute Delft (TUD) — the Netherlands — m.blaauw@tudelft.nl
www.tudelft.nl/en/faculty-of-applied-sciences/business/facilities/reactor-institute-delft

ISIS Neutron & Muon Source — United Kingdom — christopher.frost@stfc.ac.uk
www.isis.stfc.ac.uk/Pages/Industry.aspx

PSI — Switzerland — techtransfer@psi.ch
www.psi.ch/industry/industry

ASTRID 2 — Denmark — isa@phys.au.dk
www.isa.au.dk/facilities/astrid2/astrid2.asp

European Synchrotron - ESRF — France — industry@esrf.fr
www.esrf.eu/Industry

SOLEIL — France — industrie@synchrotron-soleil.fr
www.synchrotron-soleil.fr/en/industry

ANKA — Germany — esra.aran@kit.edu
www.anka.kit.edu/28.php

BESSY-II — Germany — info@helmholtz-berlin.de
www.helmholtz-berlin.de/forschung/oe/fg/mi-synchrotron-radiation/index_en.html

Metrology Light Source — Germany — info@ptb.de
www.ptb.de/cms/en/ptb/fachabteilungen/abt7/metrology-light-source.html

PETRA III — Germany — innovation@desy.de
photon-science.desy.de/facilities/petra_iii/index_eng.html

ELETTRA — Italy — ilo@elettra.eu
ilo.elettra.eu

SESAME — Jordan — info@sesame.org.jo
sesame.org.jo/sesame_2018

ALBA — Spain — industrialoffice@cells.es
www.cells.es/en/industry/services

MAX-IV — Sweden — industry@maxiv.se
www.maxiv.lu.se/industry/

Diamond Light Source — United Kingdom — industry@diamond.ac.uk
www.diamond.ac.uk/industry.html

SOLARIS (Uniwersytet Jagiellonski) — Poland — industry.solaris@uj.edu.pl
www.synchrotron.uj.edu.pl/en_GB

DAFNE & SPARC — Italy — dirlnf@lnf.infn.it
w3.lnf.infn.it/accelerators/?lang=en

CERIC-ERIC (partners listed below) — Italy (headquarters) — ilo@ceric-eric.eu
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- Austrian CERIC partner facility at the Technical University Graz and in Trieste.
- Croatian CERIC partner facility at the Ruđer Bošković Institute in Zagreb.
- Czech CERIC partner facility at the Charles University in Prague and in Trieste.
- Hungarian CERIC partner facility at the Centre for Energy Research of Science (MTA EK) of the Hungarian Academy of Science (HAS) in Budapest.
- Italian CERIC partner facility at Elettra Sincrotrone Trieste.
- Polish CERIC partner facility at the National Synchrotron Radiation Centre SOLARIS in Krakow.
- Romanian CERIC partner facility at the National Institute of Material Physics (NIMP) in Magurele.
- Slovenian CERIC partner facility at the National Institute of Chemistry in Ljubljana.

Supporting Projects

ACCELERATE supports the long-term sustainability of large scale research infrastructures (RIs) through the development of frameworks to improve the offer of tailored services to private and public entities, ensuring outreach to new scientific and industrial communities worldwide and defining common protocols for monitoring and assessing RIs' socio-economic impact.

The aim of the CALIPSOplus project is to remove barriers for access to world-class accelerator-based light sources in Europe and in the Middle East. As part of its work, CALIPSOplus has dedicated networking activities for industry (outreach and training) and a pilot SME access programme with subsidised transnational access to the CALIPSOplus partners.

The European Cluster of Advanced Laser Light Sources (EUCALL) is a network between leading large-scale user facilities for free-electron laser, synchrotron and optical laser radiation and their users. Under EUCALL, they work together on their common methodologies and research opportunities, and develop tools to sustain this interaction in the future.

NFFA-EUROPE sets out a platform to carry out comprehensive projects for multidisciplinary research at the nanoscale extending from synthesis to nano-characterisation to theory and numerical simulation. Within NFFA, 20 European facilities provide integrated access at no charge for publishable research and paid-for access for proprietary R&D.

SINE2020's Industry Consultancy programme demonstrates the potential of neutron measurement techniques and technologies to interested companies. As part of its objective to encourage industrial users to exploit the unique properties of neutron beams for R&D, SINE2020 can arrange for test measurements and feasibility studies to be performed free of charge.

In addition to the European Projects shown above, EARIV is also supported by various regional projects.

ARI Capabilities

Most of the ARIs are host institutes for synchrotron light sources, neutron sources, and lasers (including free-electron lasers). These are large-scale research facilities that provide beams of neutrons, photons, X-rays, electrons and ions for characterising materials. By studing how these beams interact with samples placed in their paths it is possible to obtain unique structural and chemical information. This goes far beyond the capabilities of standard lab-based instrumentation.

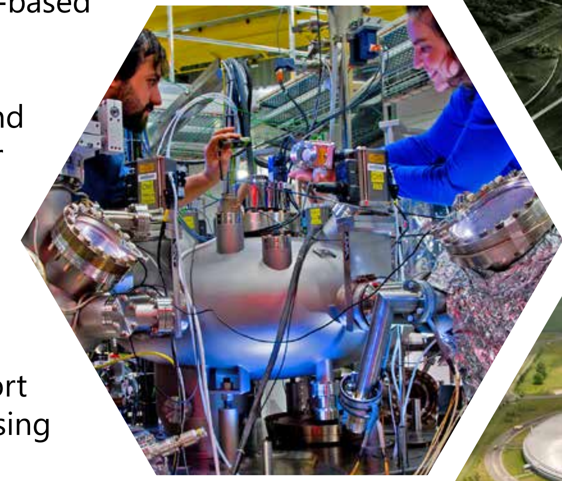
Although most of the ARIs are light and neutron sources, there are others that offer complementary techniques for materials characterisation. These include several world-renowned university departments and research institutes.

Many of the ARIs also have specialist support labs that industrial clients can use when using their facilities.

Neutrons & Photons

Synchrotrons and lasers both generate photons and are often referred to as light sources. They are mostly used for producing extremely intense X-ray and infrared beams. These X-ray beams are much brighter than those generated by standard lab-based X-ray instrumentation. Such high-brilliance beams can be used to carry out unique experiments, such as collecting data extremely quickly and collecting data from nanometre-scale sample volumes.

Neutron sources, as the name suggests, generate neutrons. Neutrons can provide unique information that is different to that from light sources. For example, they can easily penetrate through most materials, and can do so without causing any damage. They are also highly sensitive to certain elements so can highlight particular groups of atoms. Finally, neutrons are ideal for studying magnetism because they can act as a tiny, uncharged magnet.





ACCESS

Industry access to the Analytical Research Infrastructures (ARIs) can usually be arranged at short notice, and research can be carried out under non-disclosure agreements. It's even possible to mail-in samples in some cases.

The cost of access will depend upon the type of experiment being done, the instrument being used and the additional expertise required (e.g. data analysis services). There are also free (funded) access schemes available via European Projects.

Industry is also welcome to apply for free 'beam time' via peer review at most of the ARIs directly.

For futher information please contact us:

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