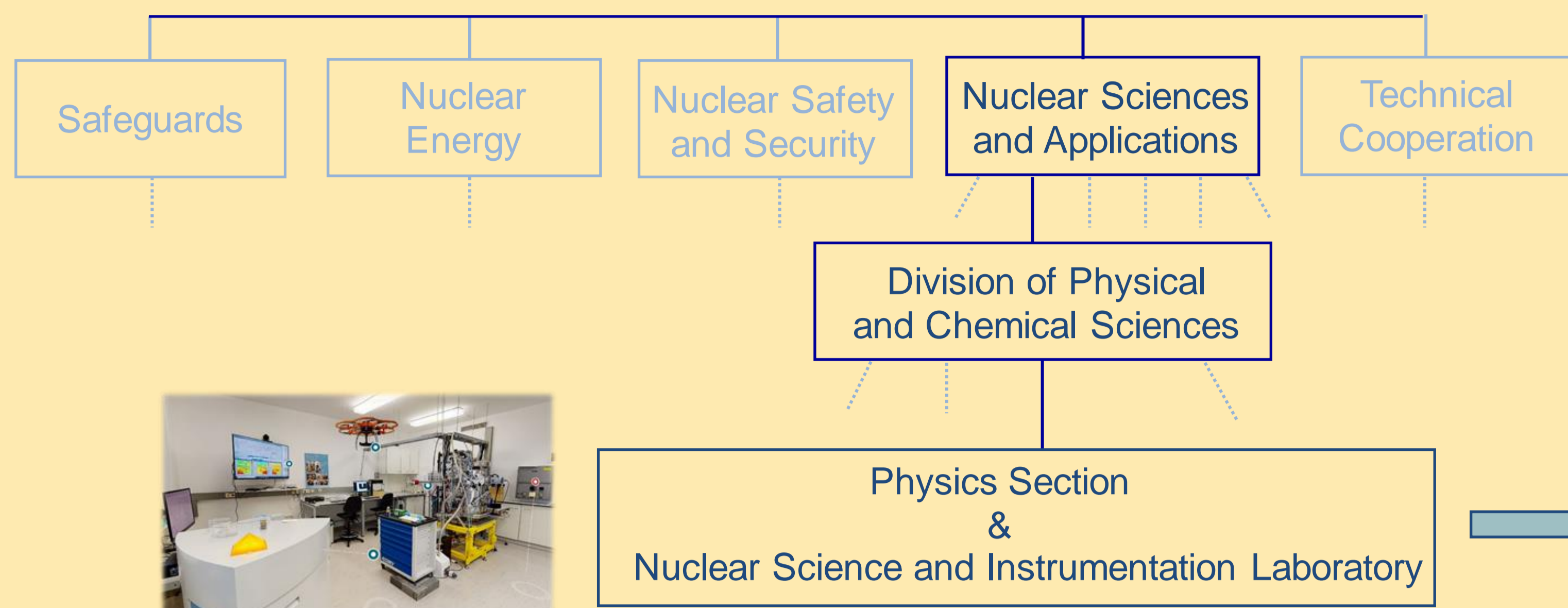


IAEA fosters the development and applications of accelerator-based analytical techniques for Heritage Science

Lena Bassel, Aliz Simon

International Atomic Energy Agency, Division of Physical and Chemical Sciences,
Vienna International Centre, P.O. Box 100, A-1400 Vienna, Austria.

IAEA organizational structure



IAEA mandate:

The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity.



Supports Member States with regard to the utilization of particle accelerators, research reactors, applications of instrumentation.

Accelerators for Natural and Cultural Heritage

Characterization, dating and imaging (2D and 3D)

- Identify the materials used to make an object
- Identify layers, sub-layers
- Identify the technologies: soldering methods, ink and pain recipes,...
- Identify the source of materials: provenance studies, trade routes
- Understand the history of individual objects: corrosion, modification and previous conservation



Authentication and detection of fakes artefacts

- Fighting against illicit trade
- Identify looted artefacts



Artefacts Preservation

- Consolidation of porous artefacts
- Disinfection and microbial decontamination



Ion Beam Analysis techniques (PIXE, RBS, PIGE, NRA), synchrotron-based XRF, Neutron Activation Analysis, Neutron imaging, AMS dating, electron beam, gamma irradiation

Towards safe analysis of heritage objects and materials

Sharing experience, knowledge and concerns together with conservators and curators is important for ensuring safe analysis of heritage objects and materials.

Documentation, preservation and publications on the effects of experiments on heritage materials are crucial.

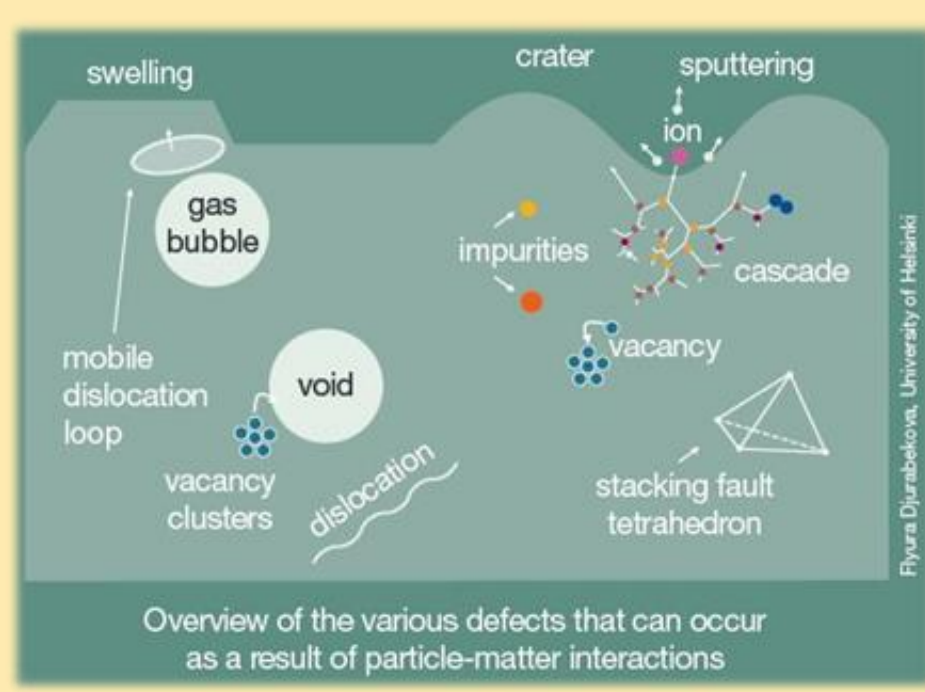
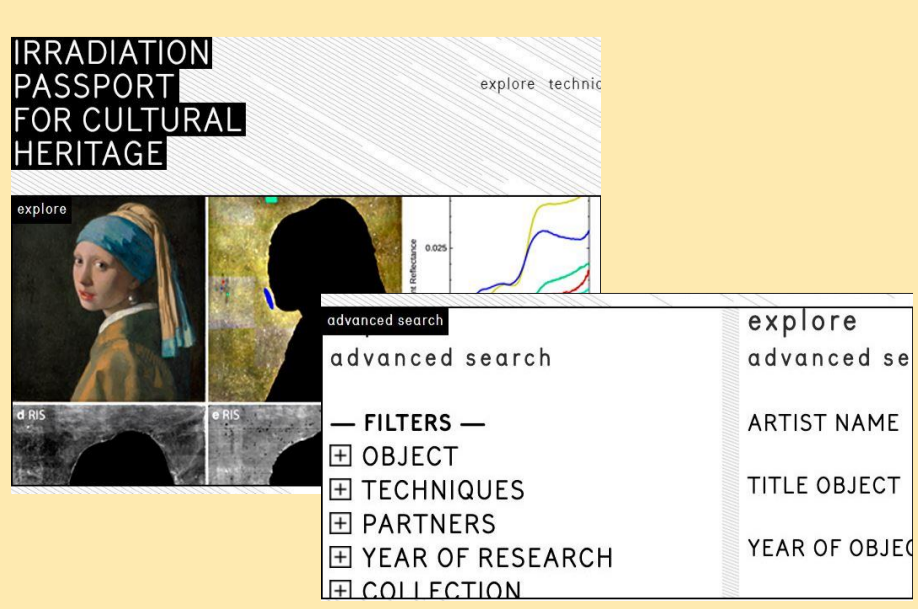
Research

- Developing good practices for minimizing radiation-induced side effects
- Studying the cause of these side effects
- Mitigation strategies for radiation damage

Documentation and Communication

- Irradiation passport
- Pamphlet
- Publication

irradiation-passport.net



Bertrand, Loïc, *et al.* "Mitigation strategies for radiation damage in the analysis of ancient materials." *Trends in Analytical Chemistry* 66 (2015): 128-145.

IAEA tools and activities

Coordinated Research

Projects conceived from assessment of member States needs/demands.
iaea.org/services/coordinated-research-activities

- Application of Two- and Three-Dimensional Neutron Imaging with Focus on Cultural Heritage Research
- Developing radiation treatment methodologies and new Resin Formulation for Consolidation and Preservation of Archived Materials and Cultural Heritage Artefacts

Technical Cooperation projects

Projects originating from Member States proposed concepts including National Projects, Regional Projects and Interregional Projects.

Workshops, trainings and meetings



Collaborating Centres

Supports IAEA programmatic activities.

- University Paris-Saclay *Atoms for Heritage* IAEA Collaborating Centre
- Australian Nuclear Science and Technology Organisation (ANSTO) IAEA Collaborating Centre



E-Learning

E-learning courses available on the IAEA Learning Management System.

elearning.iaea.org

- Portable X-ray spectrometry techniques for characterization of valuable archaeological art objects
- Neutron imaging
- Accelerator mass spectrometry radiocarbon dating for heritage and forensic science (release in October 2022)

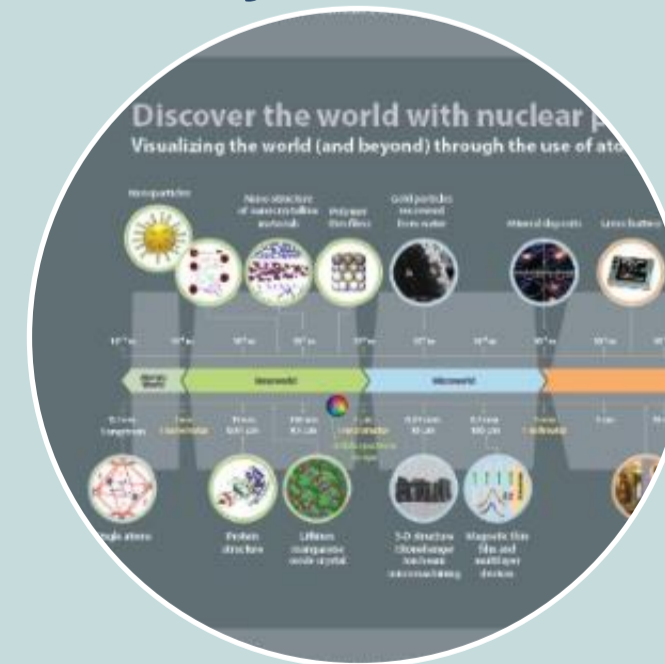


Accelerator Knowledge Portal

Knowledge resource for and by the accelerator community.

nucleus.iaea.org/sites/accelerators

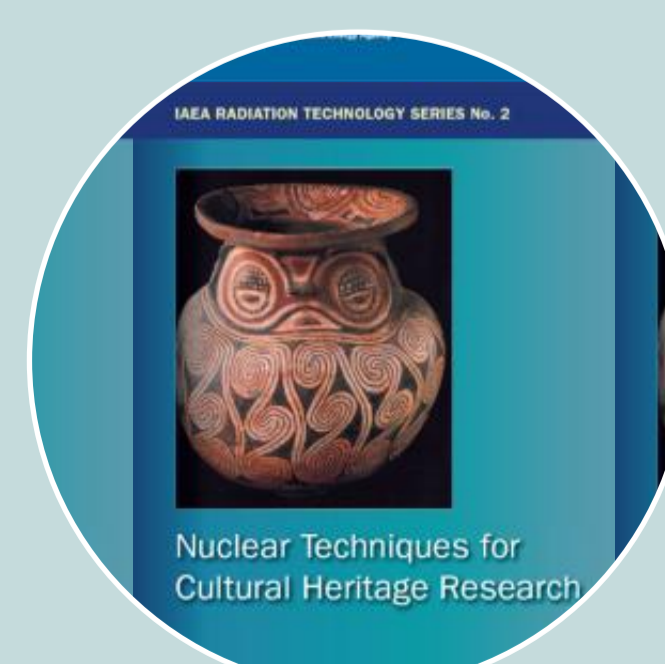
- Information exchange platform, including a database and interactive map of accelerators worldwide accessible
- Dedicated page on accelerators for Heritage



Publications

iaea.org/publications

- Advances in Neutron Activation Analysis of Large Objects with Emphasis on Archaeological Examples, IAEA-TECDOC-1838 (2018)
- IAEA (2017). Uses of Ionizing Radiation for Tangible Cultural Heritage Conservation. IAEA Radiation Technology. Series No. 6, IAEA, Vienna
- Book published soon: Good practices in disinfection of cultural heritage artefacts and archives using ionizing radiation



Contacts

• **Accelerators**
Ms Aliz Simon
Aliz.Simon@iaea.org

• **Heritage Science**
Ms Lena Bassel
L.Bassel@iaea.org

• **XRF and NSIL**
Mr Roman Padilla Alvarez
R.Padilla-Alvarez@iaea.org

• **Neutrons**
Mr Nuno Pessoa Barradas
N.Pessoa-Barradas@iaea.org

• **Preservation**
Mr Bum Soo Han
B.S.Han@iaea.org