CERIC

Central European
Research Infrastructure
Consortium

ICRI 2022
Research Infrastructures' contribution to SDGs
Cluster Physical Sciences and Engineering

Ornela De Giacomo - CERIC-ERIC

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Research Infrastructures – PSE

RI are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields.

Single-sited RIs are central facilities geographically localised in a single site or in a few dedicated complementary sites designed for user access

European Spallation Source ERIC

A multi-disciplinary research infrastructure with the vision to build and operate the world's most powerful neutron source.

Research Infrastructures

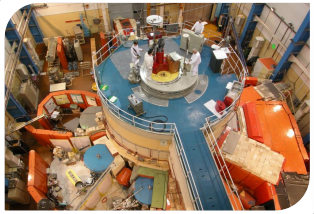
A **distributed RI** consists of a Central Hub and interlinked National Nodes

CERIC-ERIC

CERIC, the Central European Research Infrastructure Consortium, integrates and provides open access to some of the best facilities in Europe, to help science and industry advance in all fields of materials, biomaterials and nanotechnology.

Some examples…

Synchrotron



neutron

NMR

Research Infrastructures

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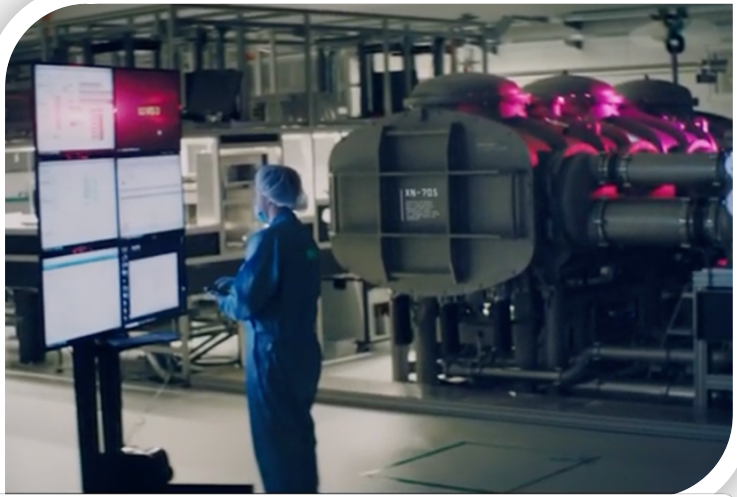

ELI-ERIC

ELI, the Extreme Light Infrastructure, is the world's largest and most advanced high-power laser infrastructure and a global technology and innovation leader in high-power, high-intensity, and short-pulsed laser systems.

Research Infrastructures

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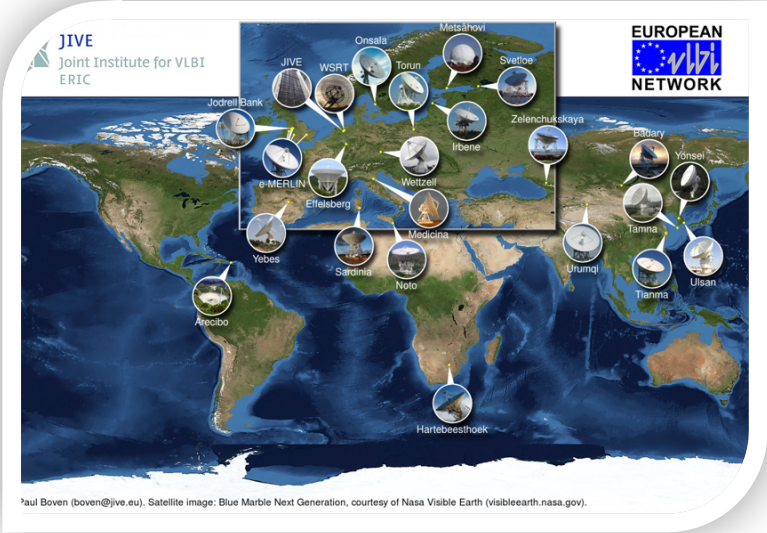


JIVE ERIC

Facilitates radio astronomical research as the data processing and user support centre of the European VLBI Network (EVN), a globally distributed research infrastructure composed by some of the largest radio telescopes on Earth

A network of radio telescopes serves to provide a complementary (and often unique) view to the Universe, with multiple technical challenges - and solutions!

Research Infrastructures in PSE

Image by Freepik

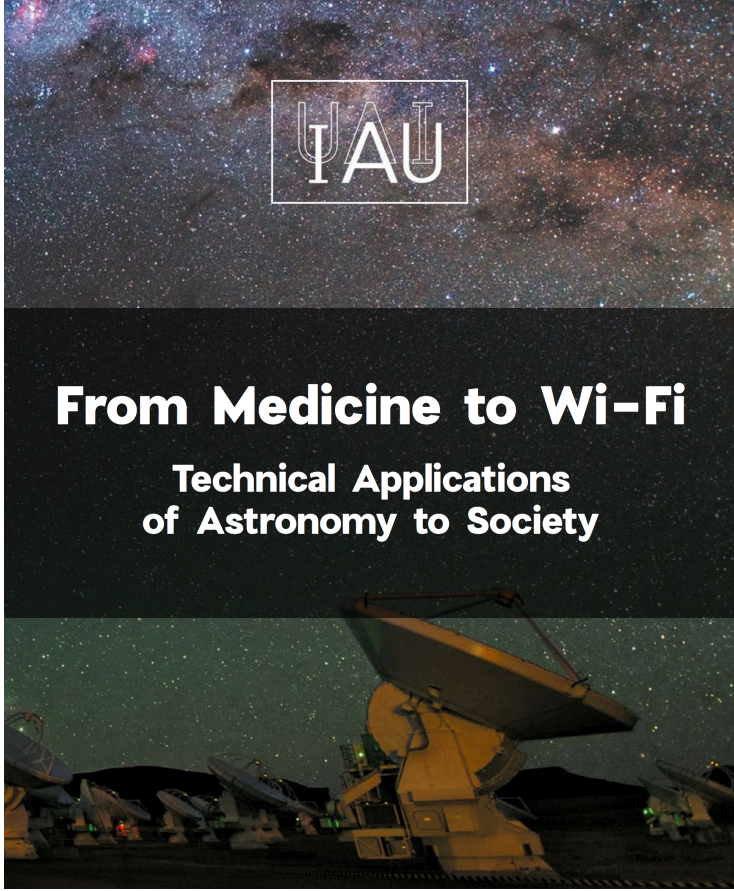
How do these large research infrastructures contribute to the Sustainable Development goals?

From Medicine to WI-FI!!

- Basic science is in the base of any application!

Astronomy contributes to:

- Medicine
- Climate change
- Computing
- Time keeping / reference frames
- Imaging
- Communication
- Big data
- WI-FI



https://www.iau.org/static/archives/announcements/pdf/ann19022a.pdf

How Astronomy contributes to the SDGs

Space geodesy supports disaster risk reduction

Capacity Building: schools, workshops, teacher training, outreach

Fostering EDI in astronomical community

Raise awareness Light Pollution

Activities targeting disadvantaged, underrepresented communities

Community programmes at observatories

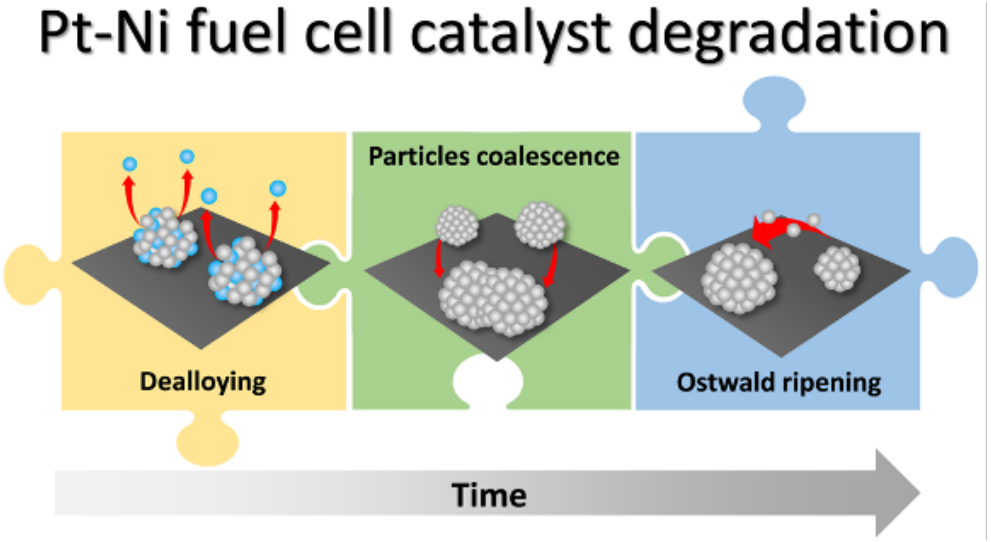
Equip young professionals with transferrable skills

Develop new technologies for peaceful purposes

Astronomy for diplomacy

New materials for cheaper PEM fuel cells

A comprehensive study provided insights into the morphological variations and degradation of a platinum-nickel alloy catalyst during operations, to improve its duration and performance.



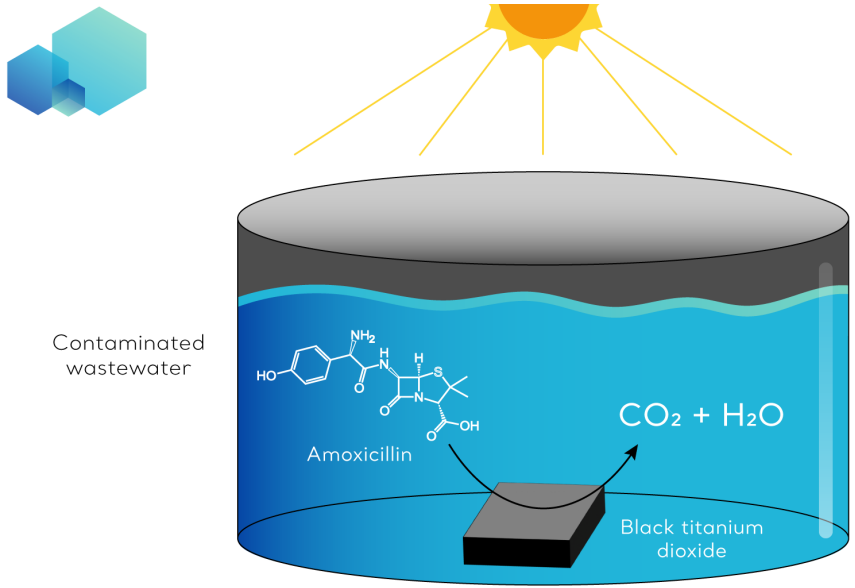
Bogar, Marco, et al. "Interplay Among Dealloying, Ostwald Ripening, and Coalescence in Pt X Ni100–X Bimetallic Alloys under Fuel-Cell-Related Conditions." *ACS Catalysis* 11.18 (2021): 11360-11370.

Preventing antibiotics' contaminations in water bodies

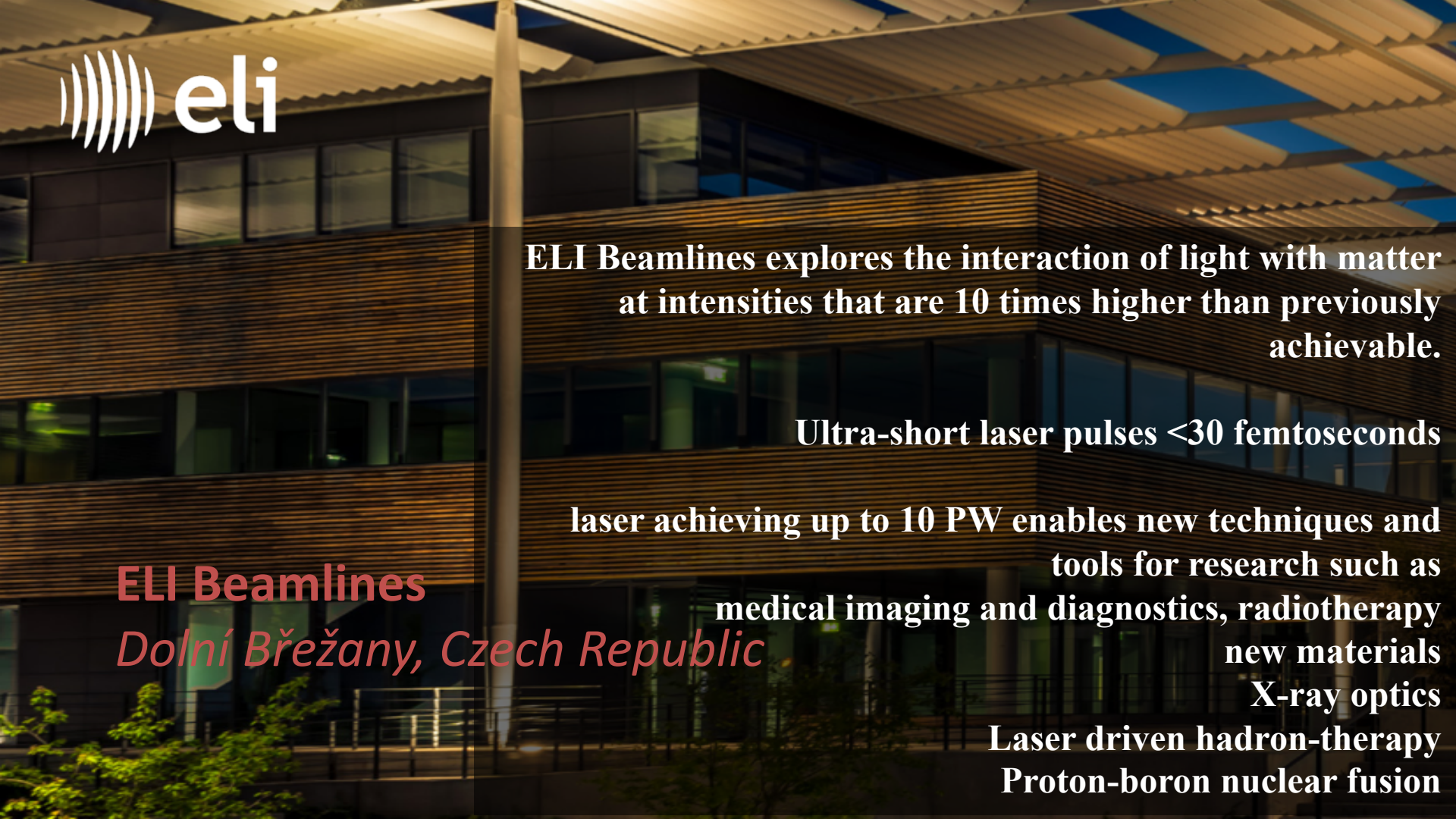
The ever-growing employment of antibiotics results in the contamination of water bodies.

Black titanium dioxide was tested for the photocatalytic degradation of amoxicillin, a common antibiotic.

The samples exhibited over 90% efficiency in the degradation of amoxicillin after 6 hours under simulated solar irradiation.



Andronic, Luminita, et al. "Visible-Light-Active Black TiO2 Nanoparticles with Efficient Photocatalytic Performance for Degradation of Pharmaceuticals." *Nanomaterials* 12.15 (2022): 2563.



ELI Beamlines

Dolní Břežany, Czech Republic

ELI Beamlines explores the interaction of light with matter at intensities that are 10 times higher than previously achievable.

Ultra-short laser pulses <30 femtoseconds

laser achieving up to 10 PW enables new techniques and tools for research such as

medical imaging and diagnostics, radiotherapy
new materials
X-ray optics
Laser driven hadron-therapy
Proton-boron nuclear fusion

ELI ERIC Leads Innovation and Technology

Training a new generation of scientists and experts

The ELI Facilities have awarded over €455 million in contracts to companies from 19 European countries

ESS - Energy storage & transformation

- More efficient energy conversion & more sustainable energy sources
- Explore material characteristics & develop more effective ways to harvest energy
- Follow lithium ions in a battery when charging & discharging to better understand and improve the process
- Smaller and more powerful batteries than ever, and can charge faster
- Opportunity to optimise material, improve energy density and increase the number of charging cycles in batteries
- Environmentally friendly energy products can be further developed which deepen our understanding of sustainable sources, such as hydrogen-powered fuel cells

Life science and medical equipment

- New drugs and treatment methods can be developed when we understand more about how drugs react with proteins
- Possibility to detect hydrogen atoms - able to study the interactions between proteins and chemical substances
- More efficient drug delivery from analysing how treatments & proteins interact on a structural level
- Structure-based drug development more likely to be successful at an earlier stage
- More efficient and sustainable solutions due to unique insights into components used in essential technology
- The study of magnetic properties and the interplay between magnetism & superconductivity can lead to advances in technology

Research Infrastructures in PSE

- The best science requires the best research infrastructures
- They contribute broadly to the Sustainable Development goals, from basic science to applications, development and transfer of technology
- Huge efforts in training, education and dissemination; impact for all society