
ESRF
The European Synchrotron

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Light Sources: Knowledge hubs for Industry

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4th Generation High-Energy Synchrotron X-ray Source

FROM 2015 TO 2024
68,000 USER VISITS FROM 67 COUNTRIES
7,000 INDIVIDUAL LABS OR UNIVERSITIES

10,000	4 + 2	2,000	10	30%
Scientific visitors each year	Nobel prizes	Scientific pubs each year	ERC grants based on ESRF-EBS	of research with industrial partners

19 PARTNER COUNTRIES
40 BEAMLINES (mostly hard X-ray)

13 MEMBER STATES

France	27.5%
Germany	24.0%
Italy	13.2%
United Kingdom	10.5%
Russia	6.0%
Benesync (Belgium, The Netherlands)	5.8%
Nordsync (Denmark, Finland, Norway, Sweden)	5.0%
Spain	4.0%
Switzerland	4.0%

6 ASSOCIATE COUNTRIES

Austria	1.75%
Israel	1.75%
Poland	1.00%
Portugal	1.00%
Czech Republic	0.60%
South Africa	0.30%

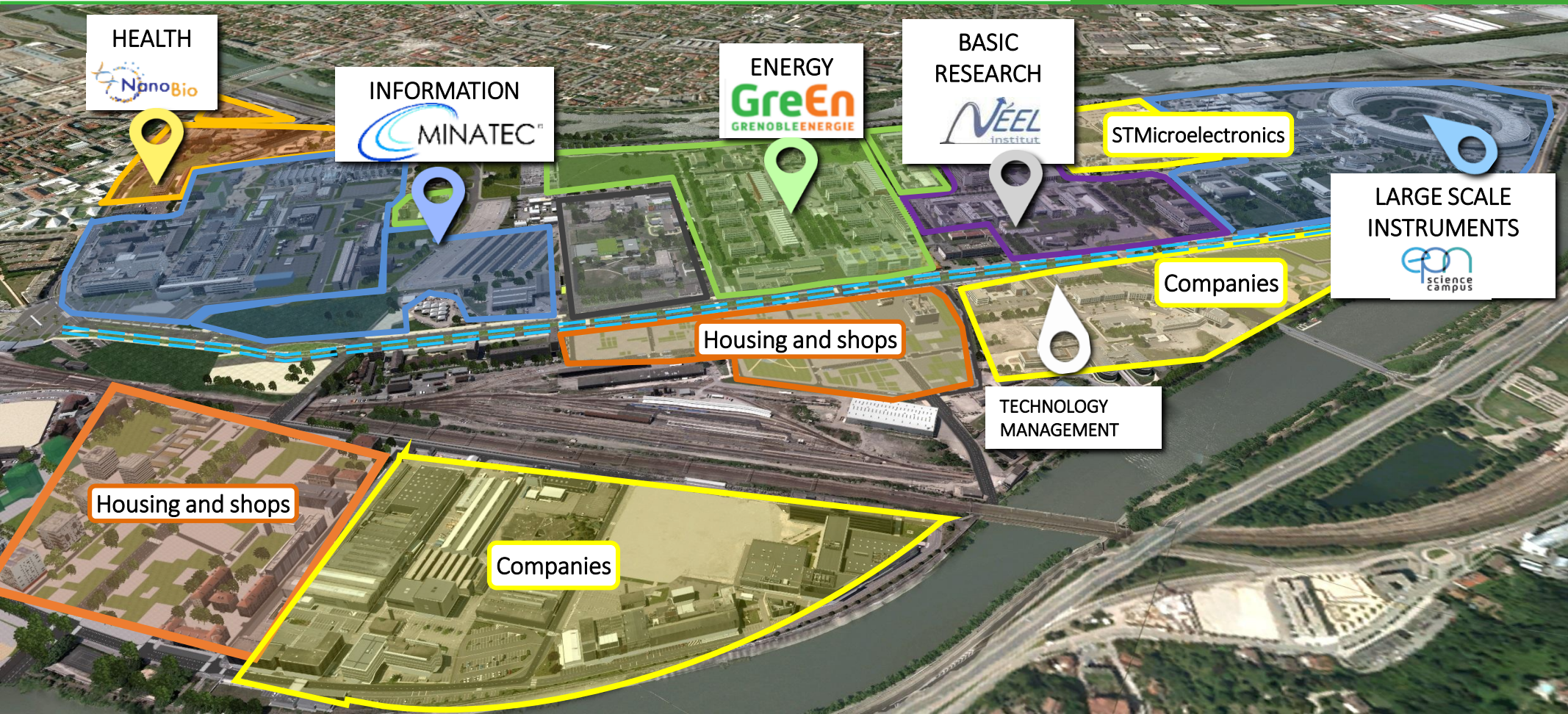
The European Synchrotron | ESRF

MORE THAN 30 YEARS OF SCIENCE AT THE HEART OF A SCIENCE AND INNOVATION EUROPEAN CAMPUS

- **3 European research institutes, members of EIROforum,** and the Institute for Structural Biology, at the heart of GIANT, the campus of Innovation (*Grenoble Innovation for Advanced New Technologies)*
- Common research and training platforms

GIANT is six thematic districts: science to tech valorisation to enterprises

GIANT
INNOVATION CAMPUS



MORE THAN 30 YEARS OF SCIENCE AT THE HEART OF A SCIENCE AND INNOVATION EUROPEAN CAMPUS

NEWS ARTICLE | 4 December 2025 | European Innovation Council and SMEs Executive Agency | 3 min read

Grenoble Alpes Métropole and Aalborg are winners of the European Capital of Innovation Awards 2026

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ampus of
logies)

- Common research and training platforms

A RESEARCH AND TECHNOLOGY INFRASTRUCTURE TO DRIVE SCIENCE AND INNOVATION

ESRF MISSIONS

- Bring nations together through science and advance knowledge
- Pioneer synchrotron technology to tackle global challenges
- Develop and operate state-of-the-art X-ray facilities and provide value to all partner countries
- Foster the use of X-rays for industry
- Train the next generations

Version including amendments
resulting from the accession of the Netherlands
to the ESRF Convention

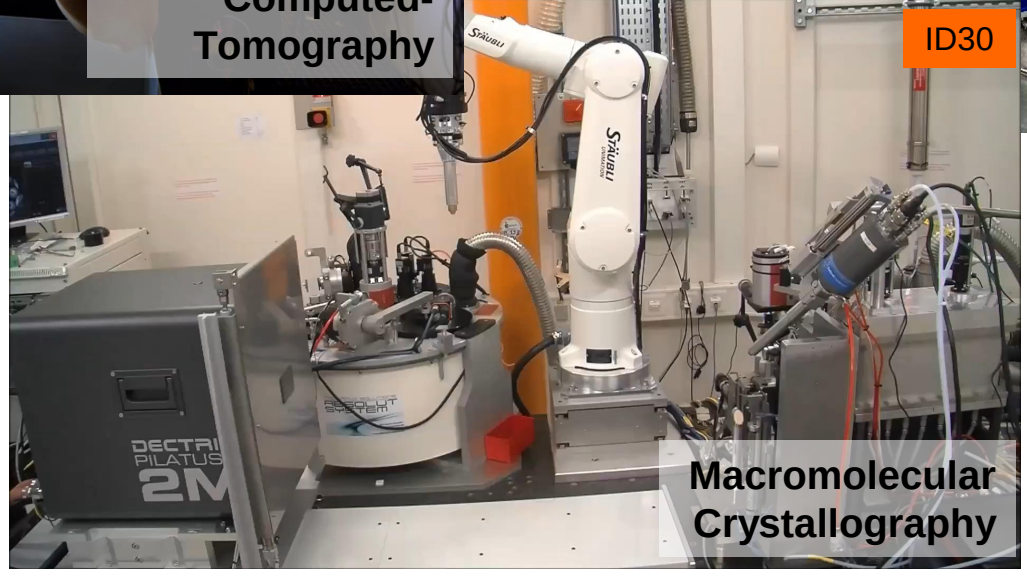
Recognizing that synchrotron radiation will in future be of great significance in many different fields and for industrial applications;

In the hope that other European countries shall participate in the activities which they intend to undertake together under this Convention;

Building on the successful co-operation of European scientists in the framework of the European Science Foundation and the preparatory work carried out under its

Photo by Tim Mossholder on Unsplash

40 X-ray beamlines: All different and all tailored

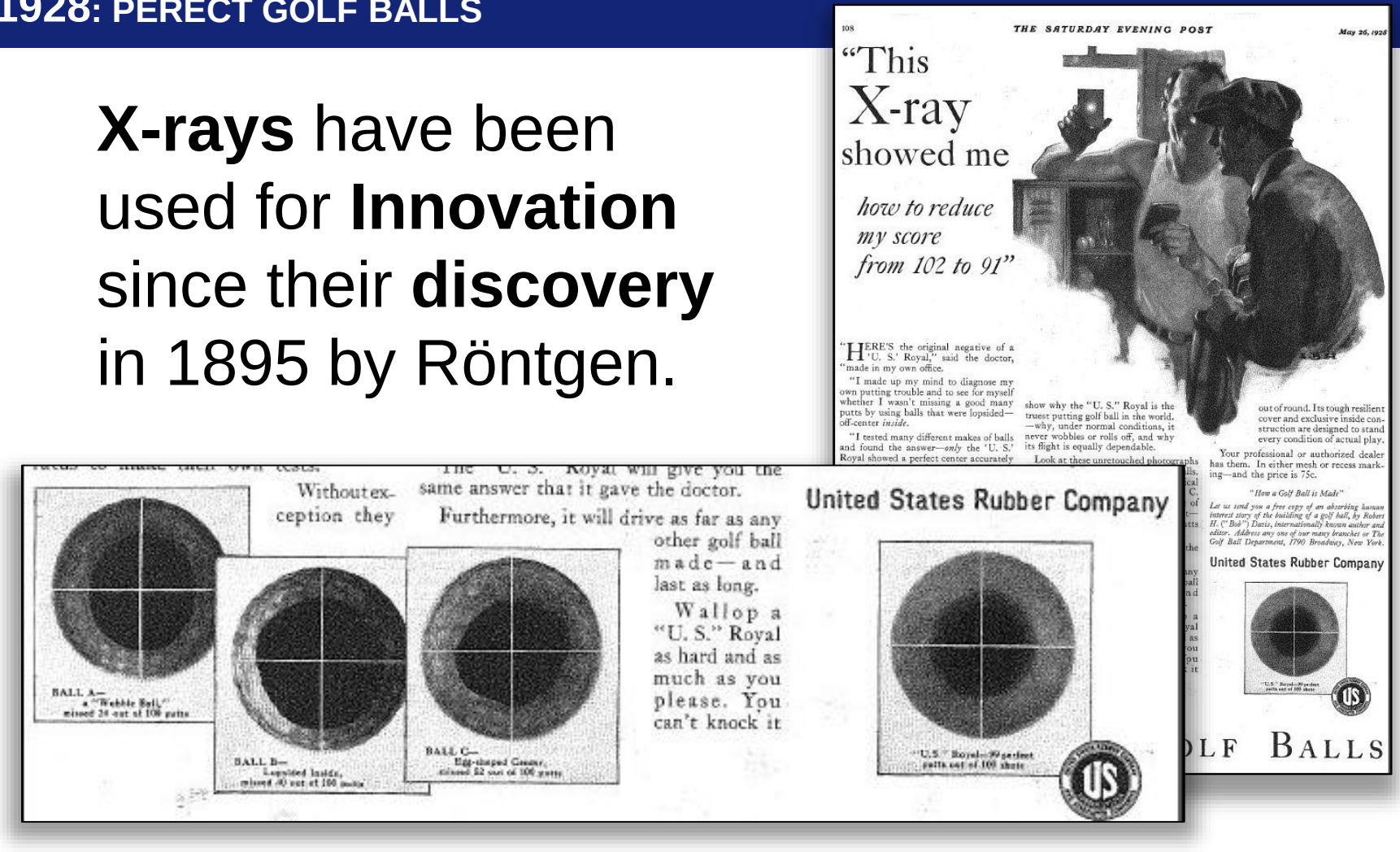


WHY WORK WITH INDUSTRY?

- **IMPACT - POLITICS:** Demonstrate use of facilities, skills and intellectual property
- **GOOD SCIENCE:** Challenging, real samples
- **EFFICIENCY DRIVERS:** New access modes, standards, efficiency
- **CAREERS:** Wider opportunities for staff
- **CASH:** More resources

1928: PERECT GOLF BALLS

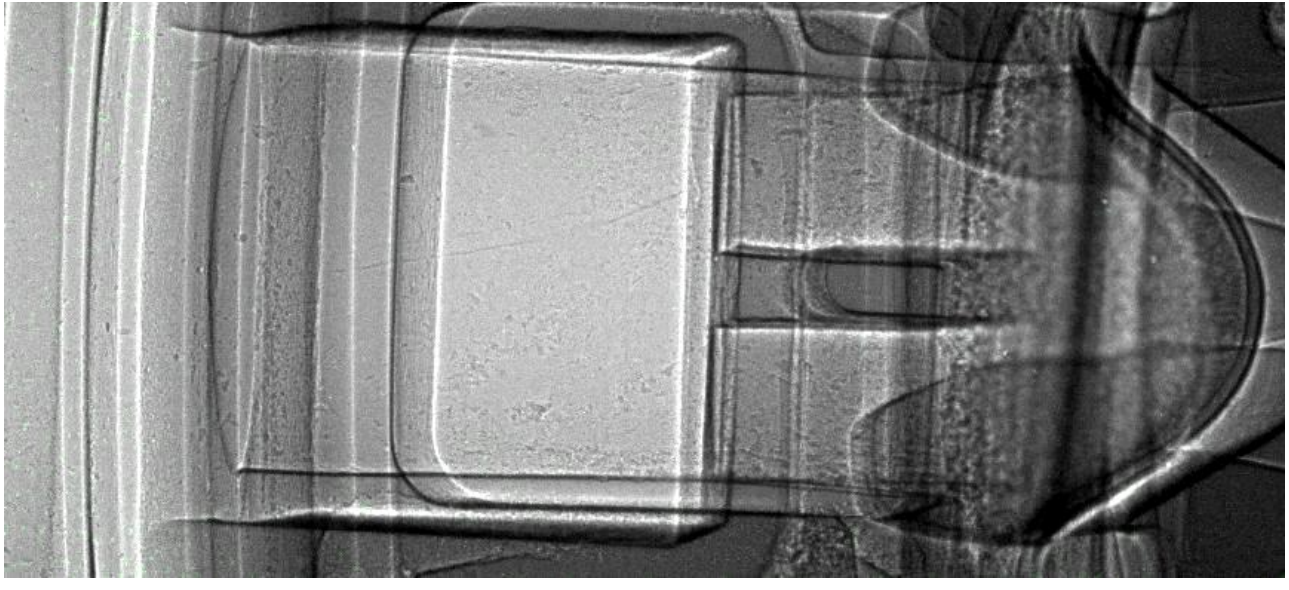
X-rays have been used for **Innovation** since their **discovery** in 1895 by Röntgen.



IMPROVING DRUG INHALER TECHNOLOGY

MedTech

ULTRA-HIGH SPEED SYNCHROTRON RADIOGRAPHY – BLINE ID19



Watching an inhaler in real time to improve its drug-delivery efficiency.

PRIOR
PLM MEDICAL

WHY DOES INDUSTRY GO TO A SYNCHROTRON?

Going far beyond conventional facilities

for advanced characterisation

1. Routine measurements

2. Complex experiments

WHY USE SYNCHROTRON X-RAYS?

Higher Penetration
(2D->3D)

Higher Spatial Resolution
(focused spot size down to 20nm-> mapping and multimodal imaging)

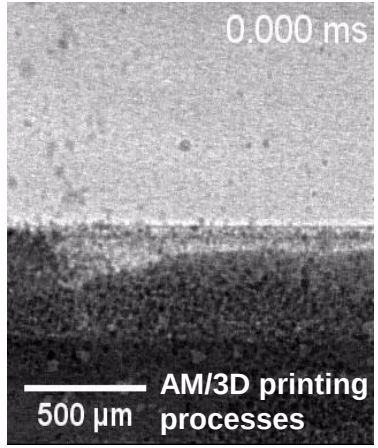
Faster
(statistical measurements, time resolved)

Improved Detection Limit
(finest chemical information)

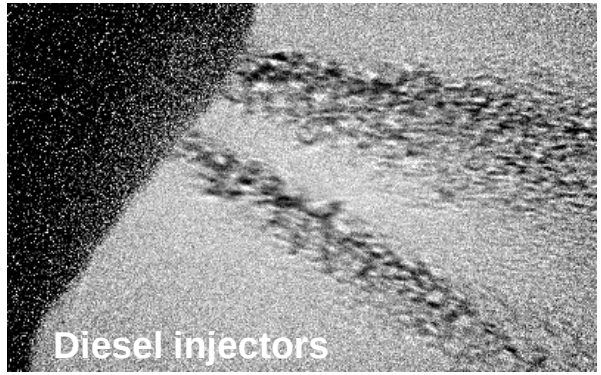
WHY USE SYNCHROTRON X-RAYS?

Higher Spatial

Real samples, real conditions



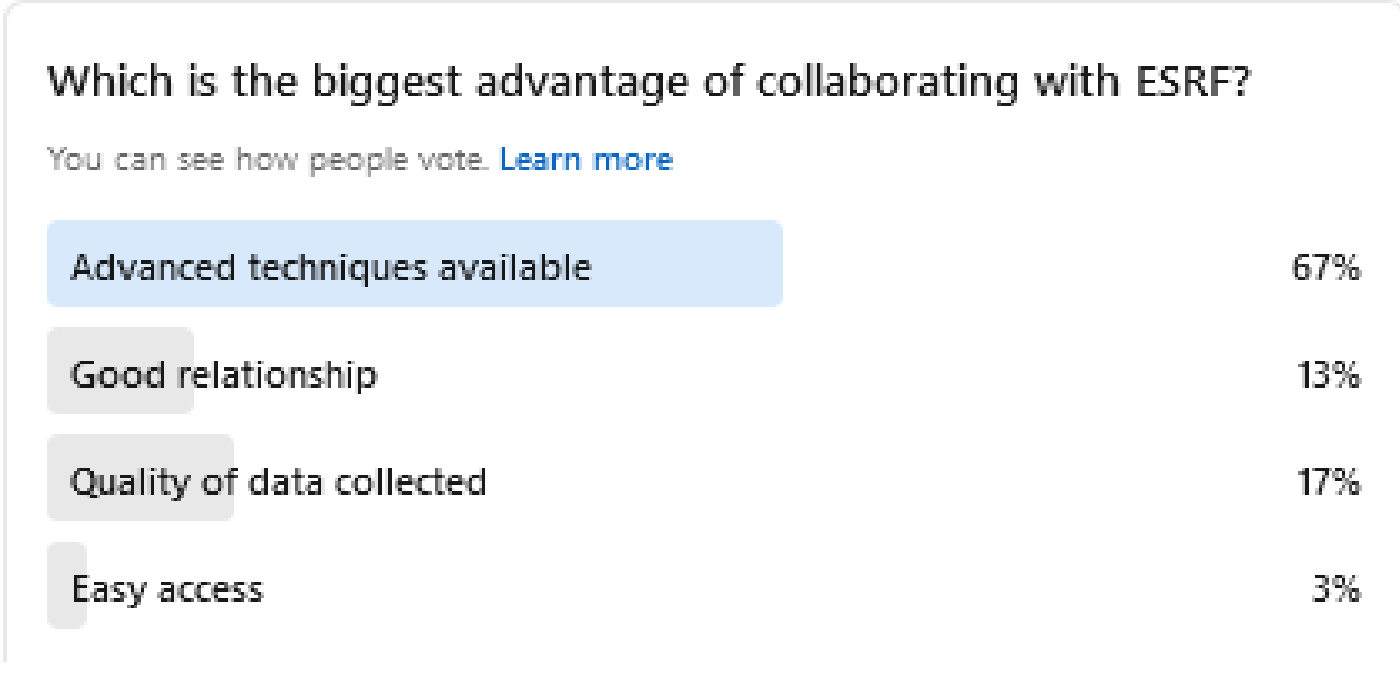
Lee et al, UCL.

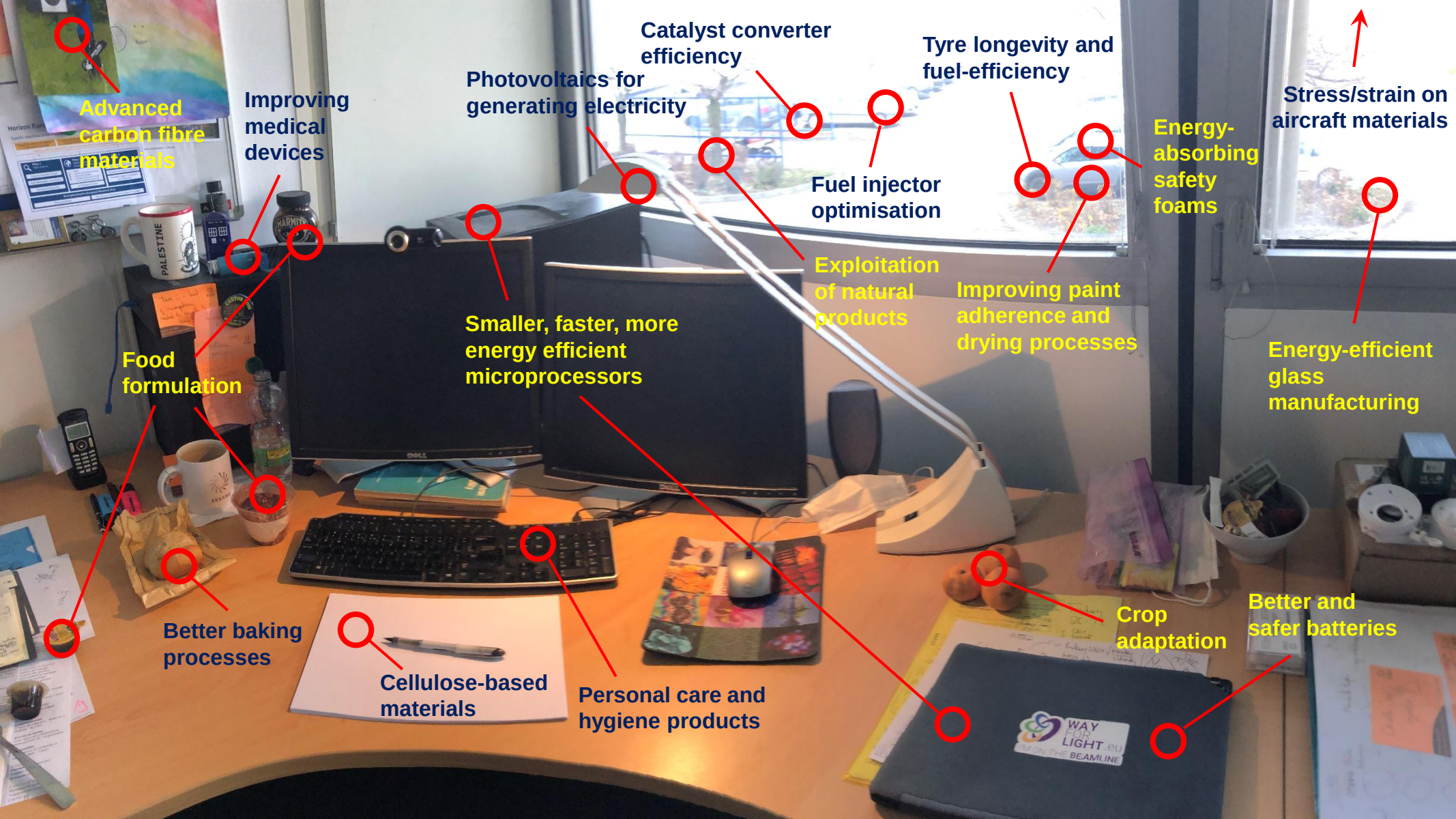


Hutchins, Prism Scientific

Put a 3D printer on the beamline, a battery abuse system, a catalyst bed, a protein crystal harvesting system…
Imagination is the only limitation.

Credit: Keith McDuffee


Which is the biggest advantage of collaborating with ESRF?
You can see how people vote. Learn more
Advanced techniques available
67%
Good relationship
13%
Quality of data collected
17%
Easy access
3%


Advanced carbon fibre materials
Improving medical devices
Photovoltaics for generating electricity
Catalyst converter efficiency
Tyre longevity and fuel-efficiency
Stress/strain on aircraft materials
Fuel injector optimisation
Energy-absorbing safety foams
Exploitation of natural products
Improving paint adherence and drying processes
Energy-efficient glass manufacturing
Food formulation
Smaller, faster, more energy efficient microprocessors
Better baking processes
Cellulose-based materials
Personal care and hygiene products
Crop adaptation
Better and safer batteries

HOW DO LIGHT SOURCES ENGAGE WITH INDUSTRY?

How does ESRF engage with industry?

PROPRIETARY SERVICES

75% income

- Rapid & confidential
- Mail-in services
- >300 clients
- 35 countries

TECH TRANSFER

25% income

- Licensed > 30 technologies
- In-house manufacturing
- Consultancy
- Technology procurement

PUBLIC ACCESS

- Competitive call for proposals
- Requirement to publish data and results
- 6-9 months delay

COLLABORATIONS & GRANTS

- Industry proposed staff
- Horizon Europe and national (e.g. IRT, BMBF, UKRI, CZI)

Innova XN

NANOELEC.

RITIFI
Research Infrastructure Technology Infrastructure For Impact

> **PROCUREMENT & SERVICES**

How does ESRF engage with indu

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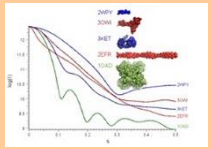
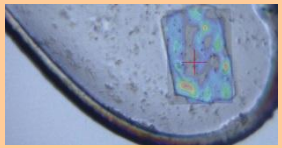
1. Fixed price “per sample” mail-in services



SAXS @ 150€



MX @ 120€

2. Tailored full service work for more complex research needs

3. Simple quote with clear terms and conditions and rapid NDA turnaround

4. Dedicated commercial admin team

5. Dedicated support scientists in key areas and rapid access

(MX, tomography, SAXS)

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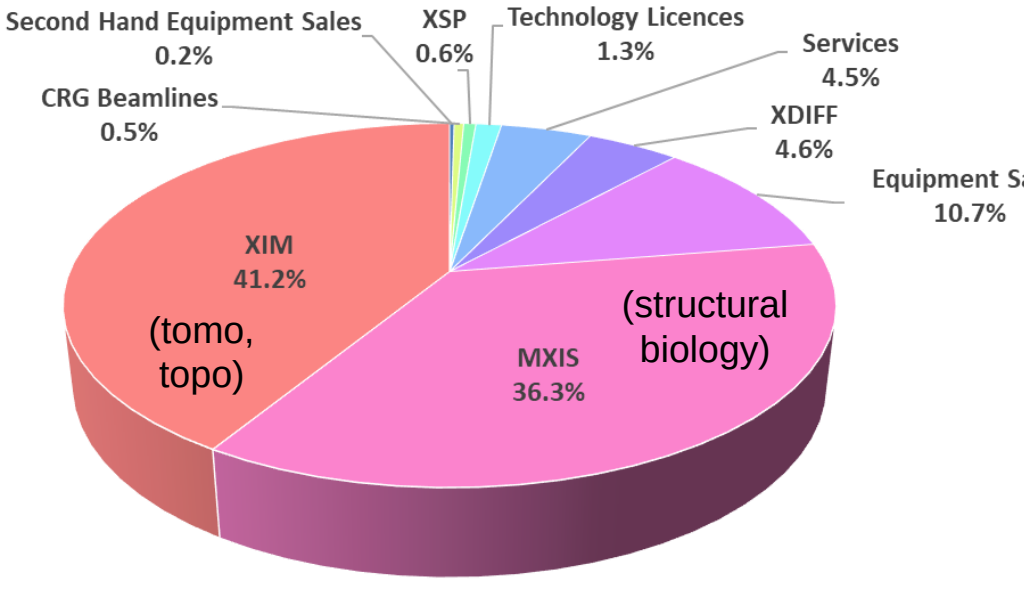
Innova XN

NANOELEC.

RITIFI Research Infrastructure Technology Infrastructure For Impact

2025: 4.0MEuros → **2025: 0.5MEuros**

ESRF impact – facts and figures – industry use and procurement



2025 commercial income

39 967 k€
cumulative commercial income over the past 15 years

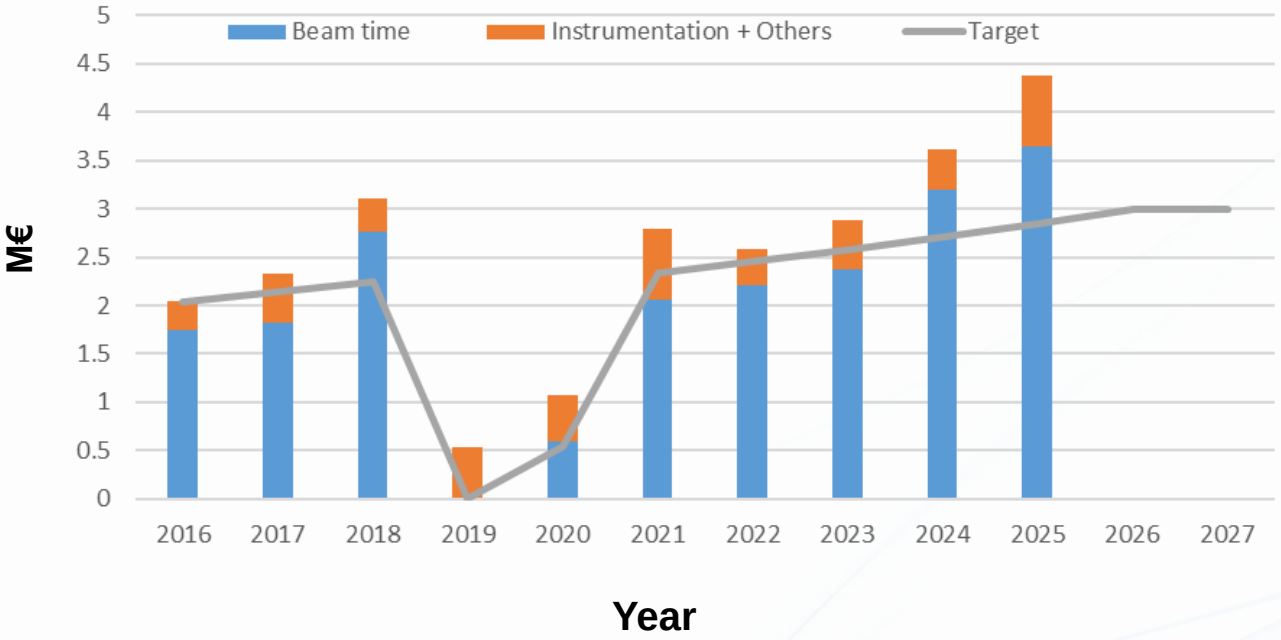
>300 companies
have used the ESRF for their R&D since 1994

>30
technology licences with companies

Around 15 000 purchase orders
placed with suppliers per year for a total of **52 M€**

1 627 active suppliers
on ESRF's procurement **database** since 2008

Commercial income at ESRF: our only formalised "value" measure



(figures exclude income due to PSI-SLS closure coverage)

Annual target initiated in 2016 at 2.0M€

5% year-on-year growth demanded

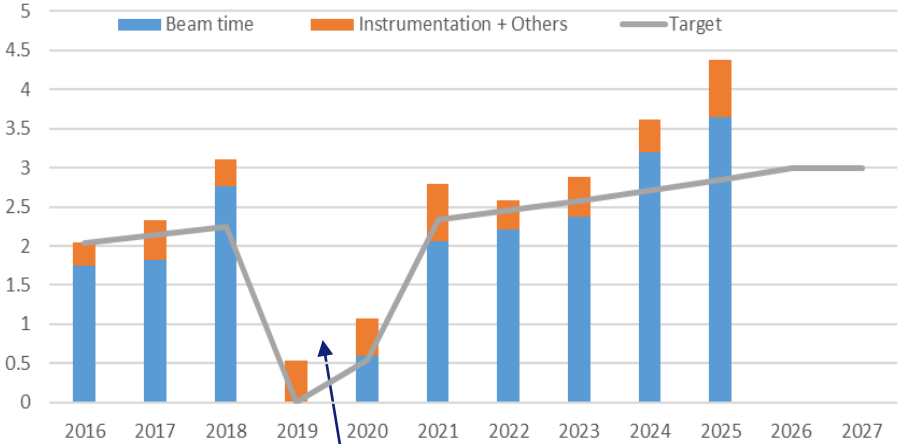
Commercial income only, excluding grants and collaborations

TENSION BETWEEN FACILITY PERFORMANCE METRICS?

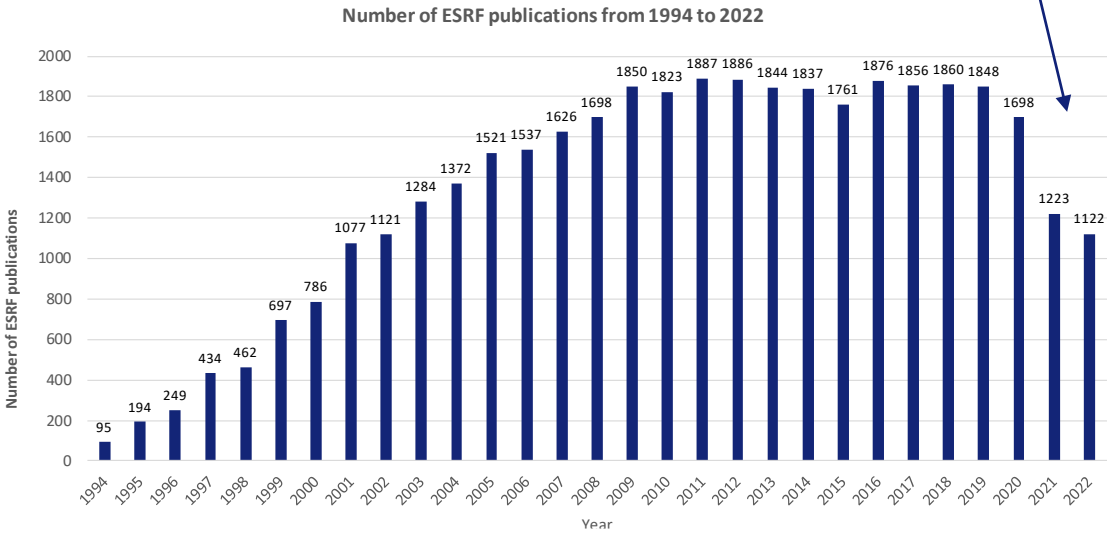
Commercial income

vs

Publication numbers



Upgrade closure impact



Upgrade closure impact

The European Synchrotron | ESRF

Industry Using our Facilities

PERCEPTIONS ARE (VERY) HARD TO CHANGE

Our view of the ESRF:

- Unique large-scale instrument
- State-of-the-art
- Fantastic science

Look what we can do!

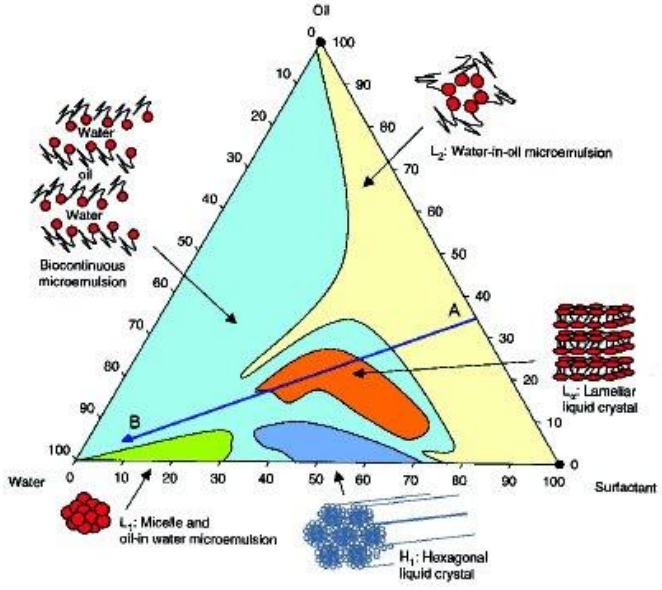
Industrial translation:

- Expensive and difficult to use
- Risky
- Fundamental science

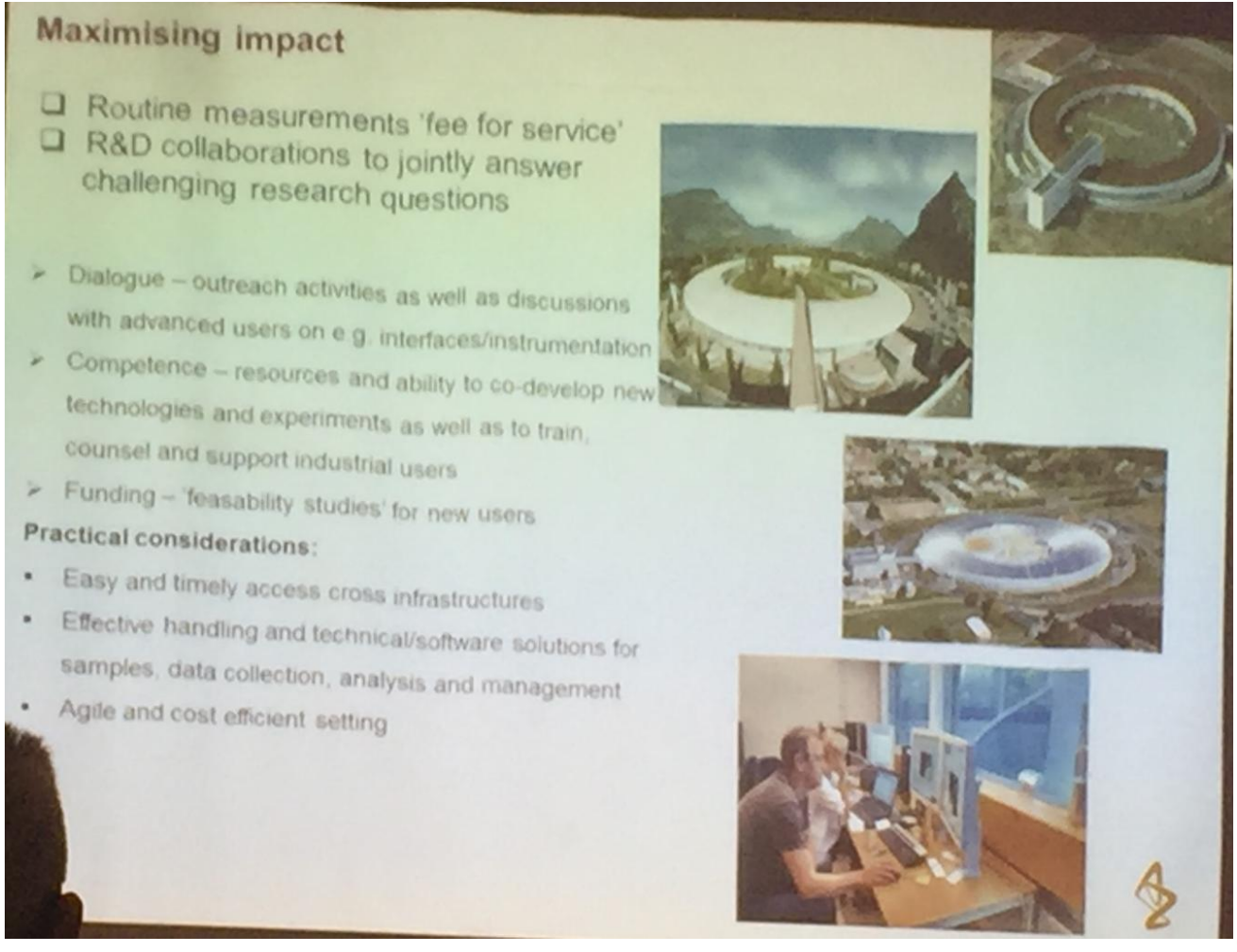
Not for me.

PRODUCT INNOVATION

PRODUCT INNOVATION



WHAT DOES INDUSTRY WANT?



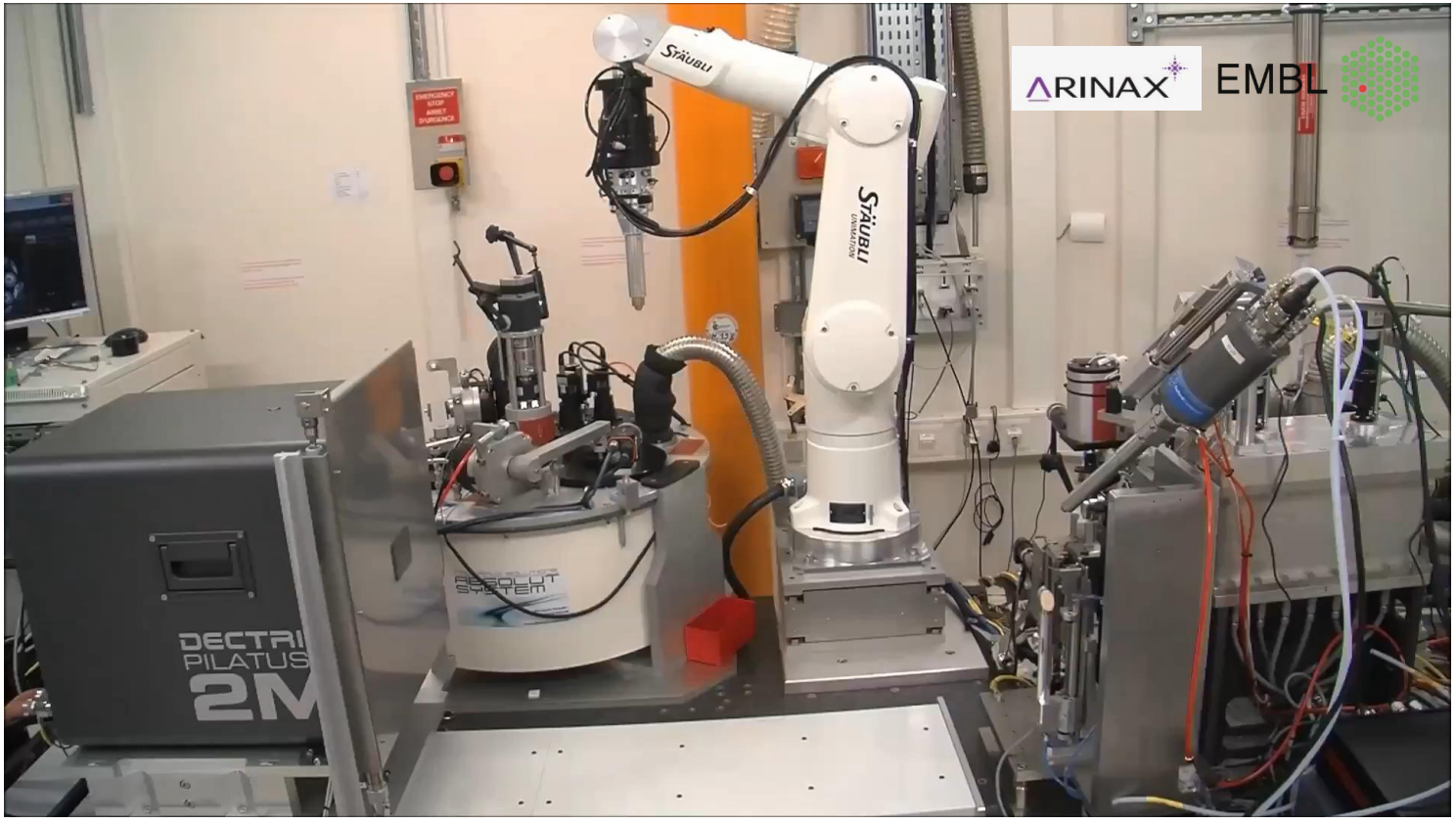
Anna Sandström
AstraZeneca

“Synchrotron as a Service”

Provide what industry actually needs.

In this case:
Automated Reliable
Rapid Cost Effective
High Quality Trusted

An integral part of drug discovery pipelines.



ESRF processes 10,000s of protein structure samples every year for the pharma industry.

“All drug targets for 34 oncology new molecular entities approved 2019-2023 were characterised using protein structures”

AstraZeneca

The European Synchrotron | ESRF

Argonne NATIONAL LABORATORY

Advanced Photon Source

IMPACT

Slides courtesy of Lisa Keefe

IMCA-CAT

Industrial Macromolecular Crystallography Association
Collaborative Access Team

Industry

IMCA Members

abbvie

Bristol Myers Squibb™

janssen
PHARMACEUTICAL COMPANIES OF Johnson & Johnson

MERCK

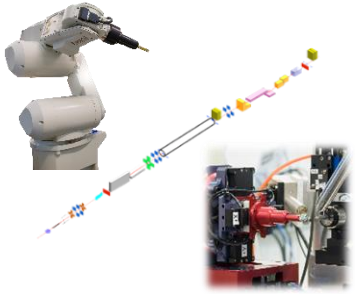
NOVARTIS

Pfizer

IMCA-CAT Subscribers

Experiment

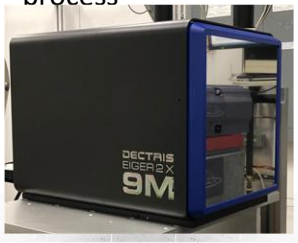
Beamline 17-ID @ APS



- focused, intense beam
- mini beam 5-50 μm
- pucks: Unipuck, ACTOR, ALS

Capabilities

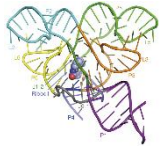
- diffraction rastering
- collect-along-vector
- auto collect & process



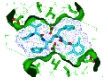
- proprietary
- rapid & frequent access
- mail-in, remote, on-site

Productivity

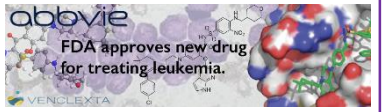
23,000+
structures annually



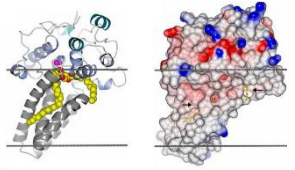
- high-throughput
- fast, encrypted data transfer
- real-time integration to company pipelines

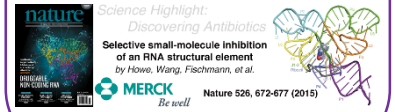


Discovery



- micro crystals
- membrane proteins
- MAD / SAD
- *in situ*





Slides courtesy of Lisa Keefe

www.imca-cat.org

Drugs

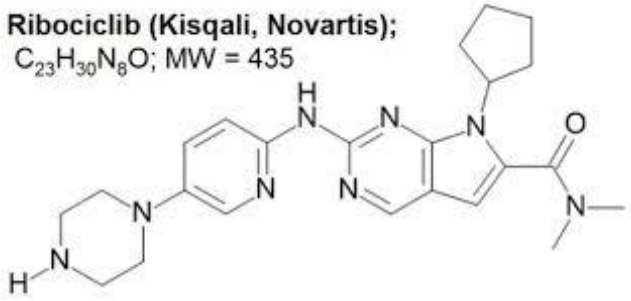
Kisqali® (Novartis)
metastatic breast cancer

FDA:
- *Breakthrough Therapy*
- *Priority Review*

NOVARTIS

KISQALI® ribociclib

FDA APPROVED



Ribocil (Merck)
antibiotic

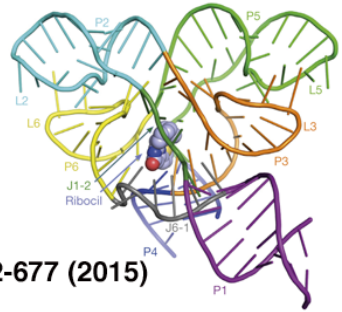
Science Highlight: Discovering Antibiotics

Selective small-molecule inhibition of an RNA structural element

by Howe, Wang, Fischmann, et al.

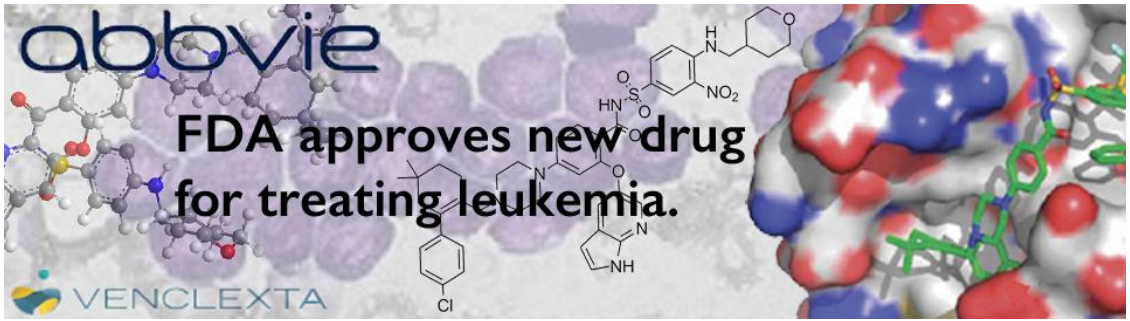
MERCK *Be well*

Nature 526, 672-677 (2015)



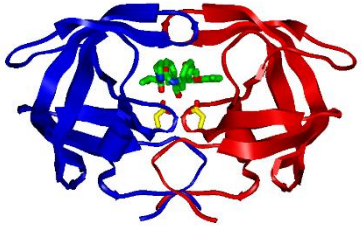
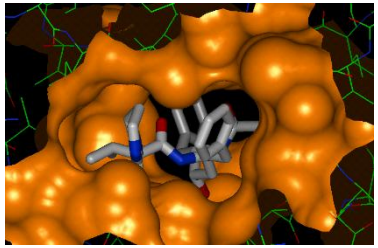
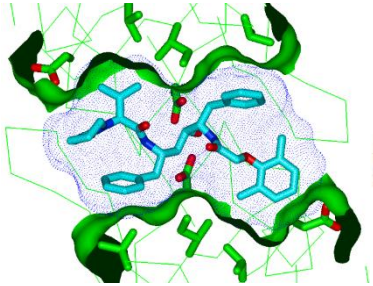
Venclexta™ (AbbVie)
chronic lymphocytic leukemia

FDA:
- *Breakthrough Therapy*
- *Priority Review*



Drugs

Kaletra® (Abbott)
AIDS

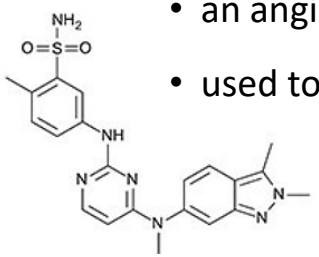
KALETRA®
(lopinavir/ritonavir)

Januvia ® (Merck)
type 2 diabetes

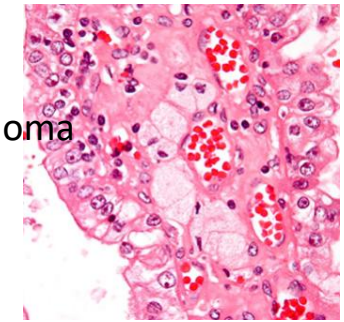
- approved by the FDA in 2006
- one of the most popular type 2 diabetes drugs on the market

Januvia®
(sitagliptin, MSD)

Votrient ® (GSK)
kidney cancer



- an angiogenesis inhibitor
- used to treat advanced renal cell carcinoma

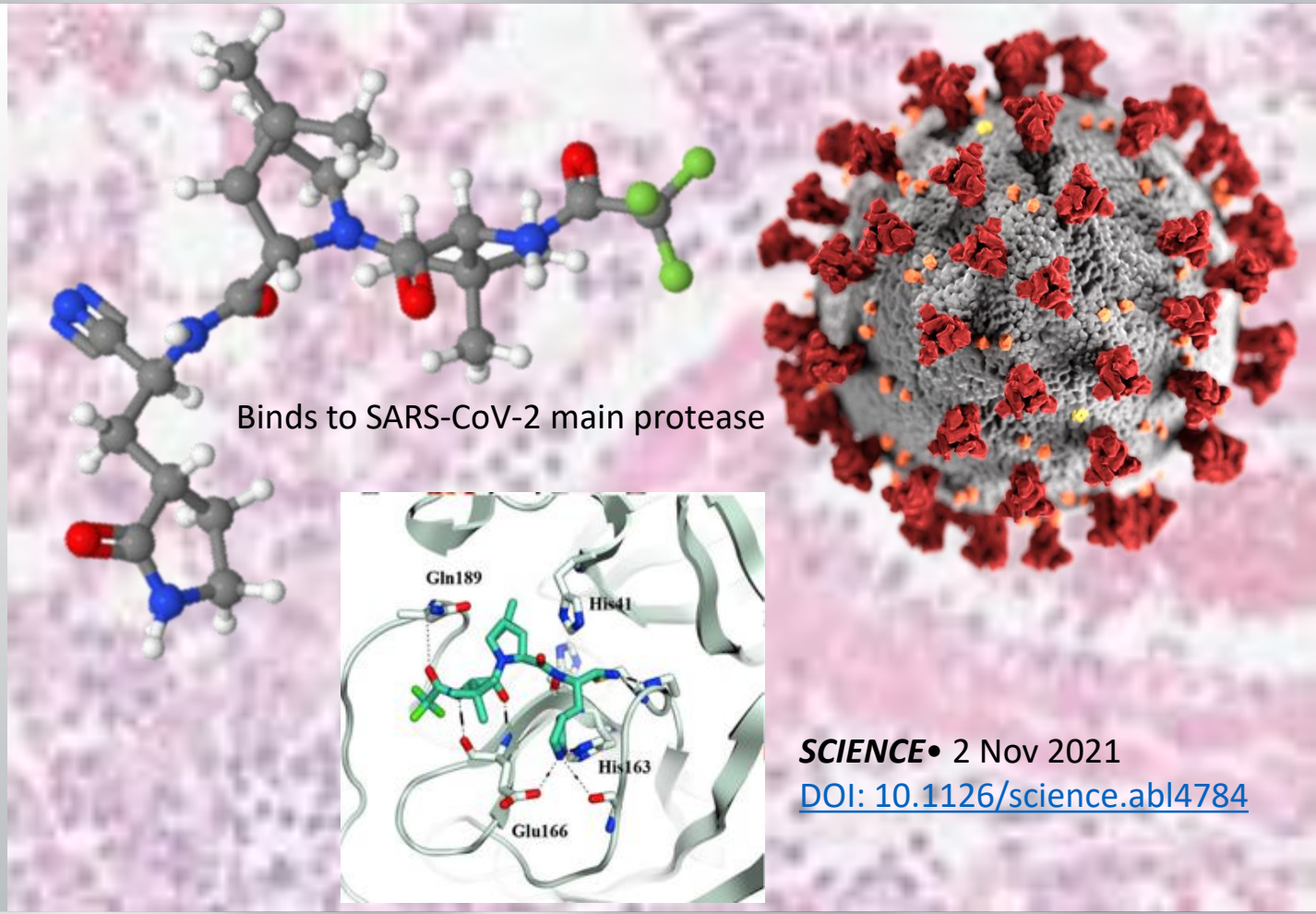


Votrient®
pazopanib

Drugs

Paxlovid™

Pfizer



SCIENCE • 2 Nov 2021
DOI: 10.1126/science.abl4784

Win-win format

Magnus@MAXIV - “Not static, fitting needs”

Big data to drive industry: high-speed X-ray powder diffraction

BASF
We create chemistry

STREAMLINE

- Catalysts
- Battery Materials
- Agrochemicals
- Pharmaceutcals
- Process Additives

Bundesministerium für Bildung und Forschung

Startup creation which has raised >1M€, employs 10 people, collecting data on thousands of samples for industry clients.

momentum Transfer

ESRF
The European Synchrotron

DESY

NO-STAINING HIGH PERFORMANCE IMAGING

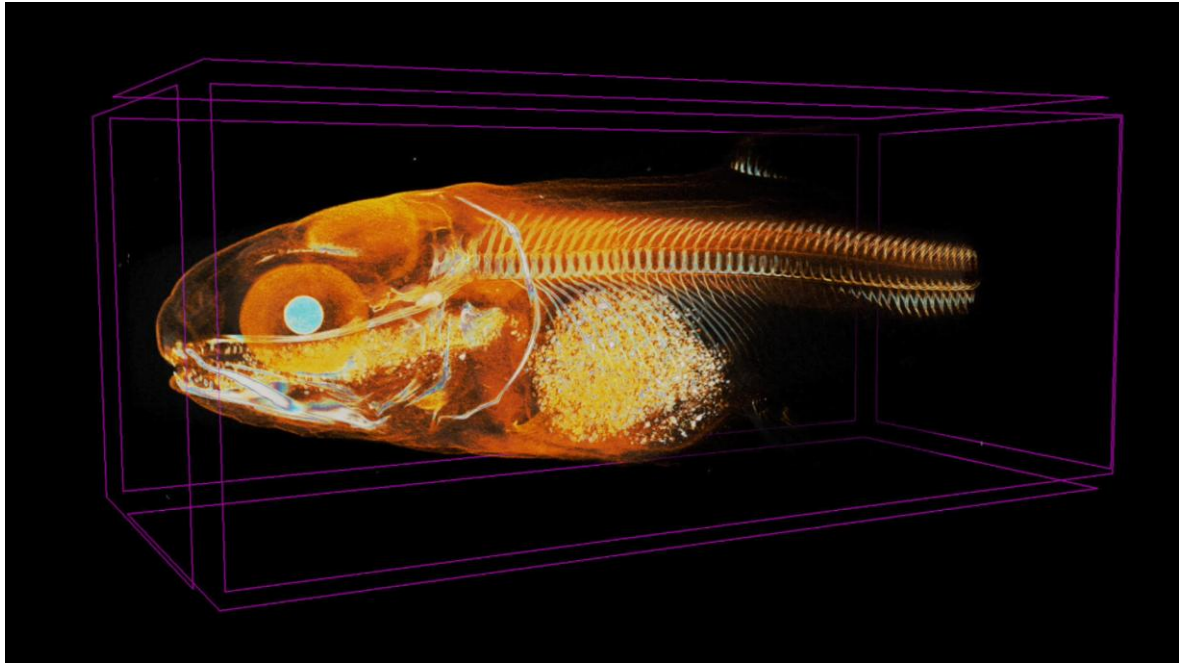
Pisciculture

RTO expertise

X-RAY COMPUTED TOMOGRAPHY– BLINE BM05

DANISH TECHNOLOGICAL INSTITUTE

BioMar



Biomar interested in how experimental diets affect fish digestion process, which is why they saw a great potential in non-destructive 3D imaging as a complement to dissection and histological analysis.

https://www.dti.dk/synchrotron-imaging-of-low-density-materials/visualization-of-soft-tissue-in-small-fish-phase-contrast-ct/43911,3

NO-STAINING HIGH PERFORMANCE IMAGING

X-RA

Pisciculture

RTO expertise

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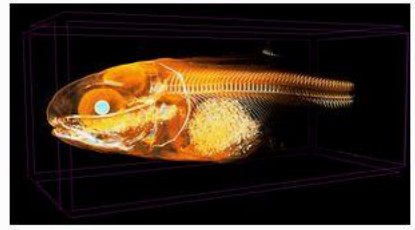
News

Non-destructive 3D imaging expands aquafeed research tools

Thursday, April 21, 2022

The Danish Technological Institute (DTI), in collaboration with BioMar, investigated batches of fish larvae after being fed different experimental diets. BioMar was interested in how the experimental diets affect the digestion process of fish, and the company found great potential in non-destructive 3D imaging as a complement to dissection and histological analysis.



"Our collaboration with DTI has tremendously aided in expanding our research tools to increase our knowledge of fish physiology. The overarching gain to include this top-of-the-art technology is to continue improving what we offer to the aquaculture industry in form of a feed. In other words, each pellet we produced is based on solid science, and this exciting collaboration provided us with the right tools," said Pedro Gómez, senior scientist, Biomar Denmark.

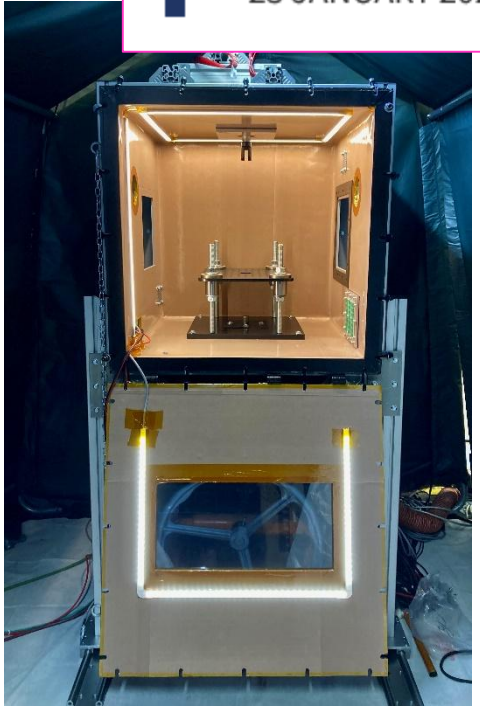
d in how
ts affect fish
s, which is why
potential in
3D imaging as
dissection
analysis.

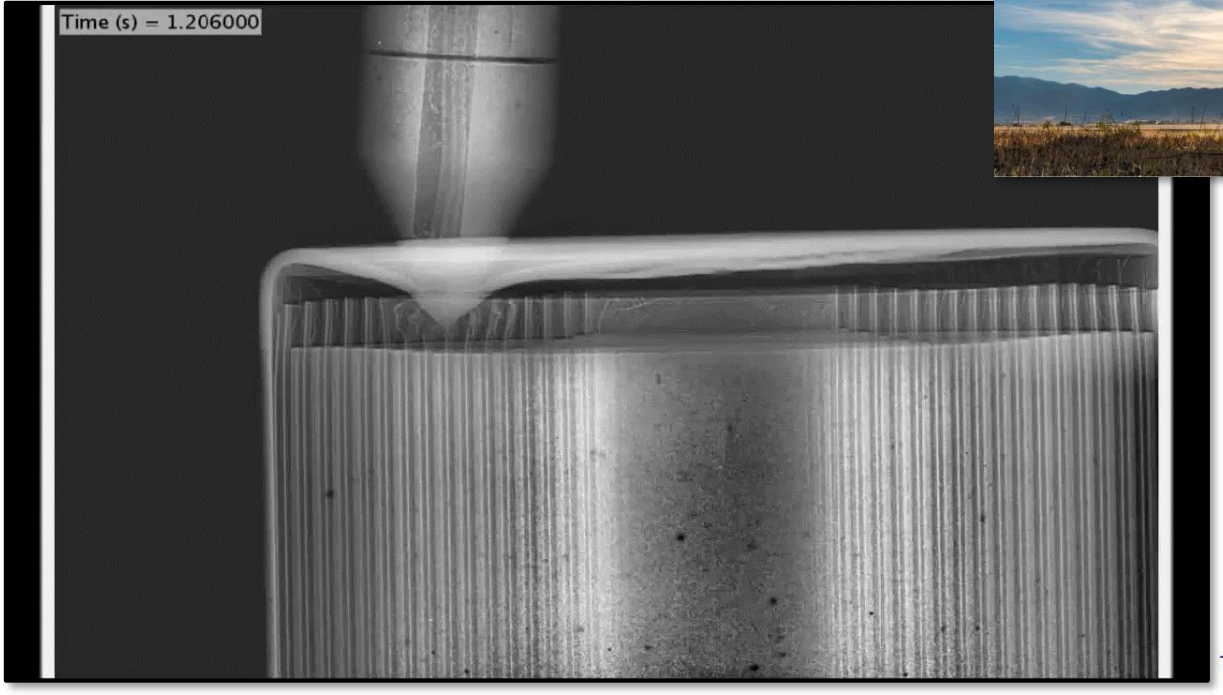
https://www.dti.dk/synchrotron-imaging-of-low-density-materials/visualization-of-soft-tissue-in-small-fish-phase-contrast-ct/43911,3

https://www.aero-mag.com/archer-aviation-signs-deal-with-nasa-on-battery-development

Archer Aviation signs deal with NASA on battery development

23 JANUARY 2024 • IN **NEWS**



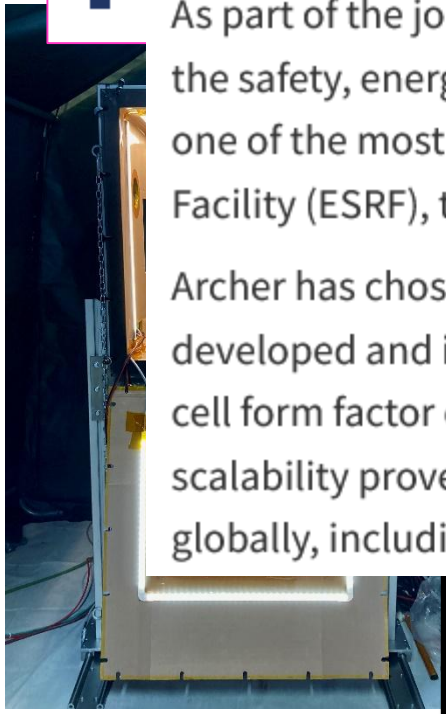


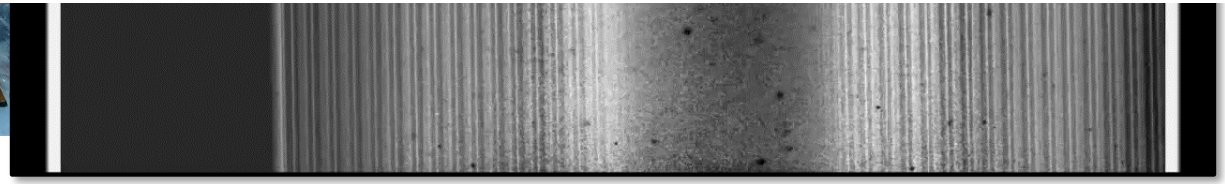
Archer Aviation signs deal with NASA

“We’re extremely proud to partner with NASA, who has pioneered the eVTOL industry over the last three plus decades, in support of our collective mission to ensure U.S. leadership in aerospace continues for decades to come,” said Adam Goldstein, Archer’s Founder and CEO.

As part of the joint efforts around battery characterisation, NASA and Archer will focus on further testing the safety, energy and power performance capabilities of the battery cells. Tests will be performed using one of the most advanced high speed X-ray facilities in the world, the European Synchrotron Radiation Facility (ESRF), to understand how the cells function during extreme abuse cases.

Archer has chosen these cells to power the proprietary electric powertrain system Archer has designed, developed and is beginning to mass manufacture for its production electric air taxi, Midnight. The battery cell form factor chosen by Archer, a cylindrical cell, has a track record of safety, performance and scalability proven through decades of volume manufacturing, deployed across many applications globally, including in millions of electric vehicles.



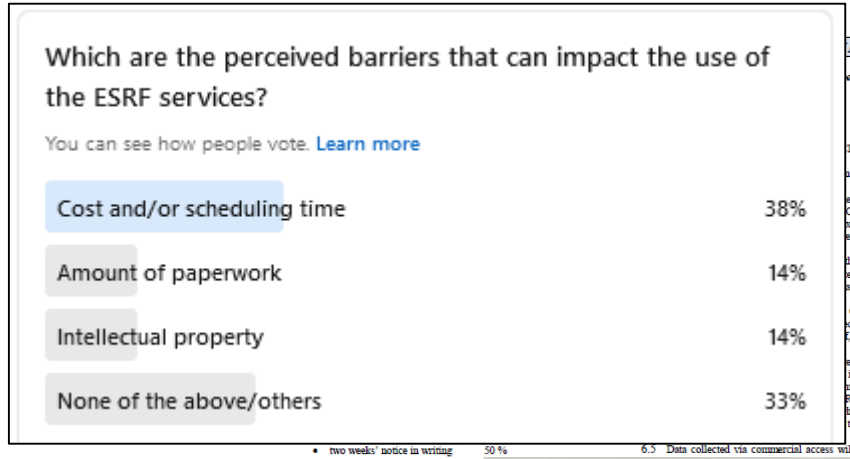


SOME THINGS CANNOT BE CHANGED….

But we can try to make them easier and lower barriers:

- Safety and regulatory steps
- Administrative access steps
- Sending samples - tracking
- Legal: simple quotes and clear T&C
- Acceptance of company NDA, MSA, MTA models

Formalised quality assurance frameworks?



TamaTA-Innov: Boosting SME innovation with advanced X-ray analysis

European H2020 project “LEAPS Innov” enabling subsidised & confidential access for SMEs.

Easy and fast applications - Κρατώντας το απλό!

To apply: www.wayforlight.eu/en/industries

Clients using the TamaTA SME support:

- ✓ *“We obtained very useful results for **improving the formulation and manufacturing process** of a very innovative product that we are currently introducing in the market.”*
- ✓ *“We are extremely satisfied with the results and they have given us **new insights into our materials discovery** pipeline.”*

an Synchrotron | ESRF

SUPPORTING INNOVATIVE SME COMPANIES

Takis Biotech (It)

- COVID therapy
- ID23-2/micro-MX

Scandiflash (Se)

- Instrumentation
- ID19/MHz radiography

Hey Planet (Dk)

- Food ingredients
- BM05/micro-CT

Recyclable Materials Development at Analytical Research Infrastructures

International cooperation network for Circular Materials Research and Innovation

4 year project

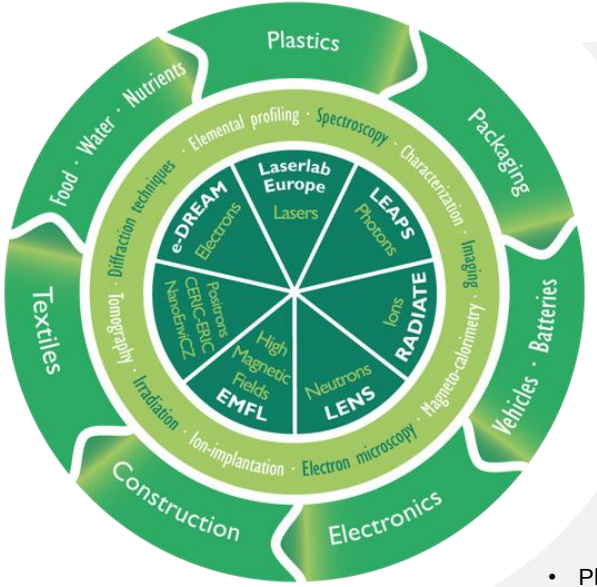
15MEUR

50+ Research Infrastructures in 18 European countries

20+ Analytical techniques
synchrotron, laser, ion, electron, magnetic field, positron, neutron

Collective access to key research infrastructures for researchers addressing the circular economy

- **Professional expert support**
- **Personalised training for new users**
- **Tailored access for industry**



Impact and Reach

400+ academic projects

33 SME projects

12 Industry pilot projects

10 training workshops and **>30** Webinars

Most-used multi-technique combinations

- **Synchrotron** + Electron Microscopy
- **Synchrotron** + Ion Beam Analysis
- Electron Microscopy + Ion Beam Analysis

Top CEAP sectors with highest demand

- Batteries and Energy Storage
- Electronics & IC
- Plastics & Packaging
- Construction & Building Materials

A project funded by the European Union as part of the Horizon Europe call HORIZON-INFRA-2021-SERV-01 and co-funded by UK Research and Innovation (UKRI) and by the Swiss State Secretariat for Education, Research and Innovation (SERI).

Funded by the European Union
UK Research and Innovation
Project funded by

Multiscale 3D imaging of additive manufactured heat exchangers

ReMade@ARI

Supporting industry with state-of-the-art techniques

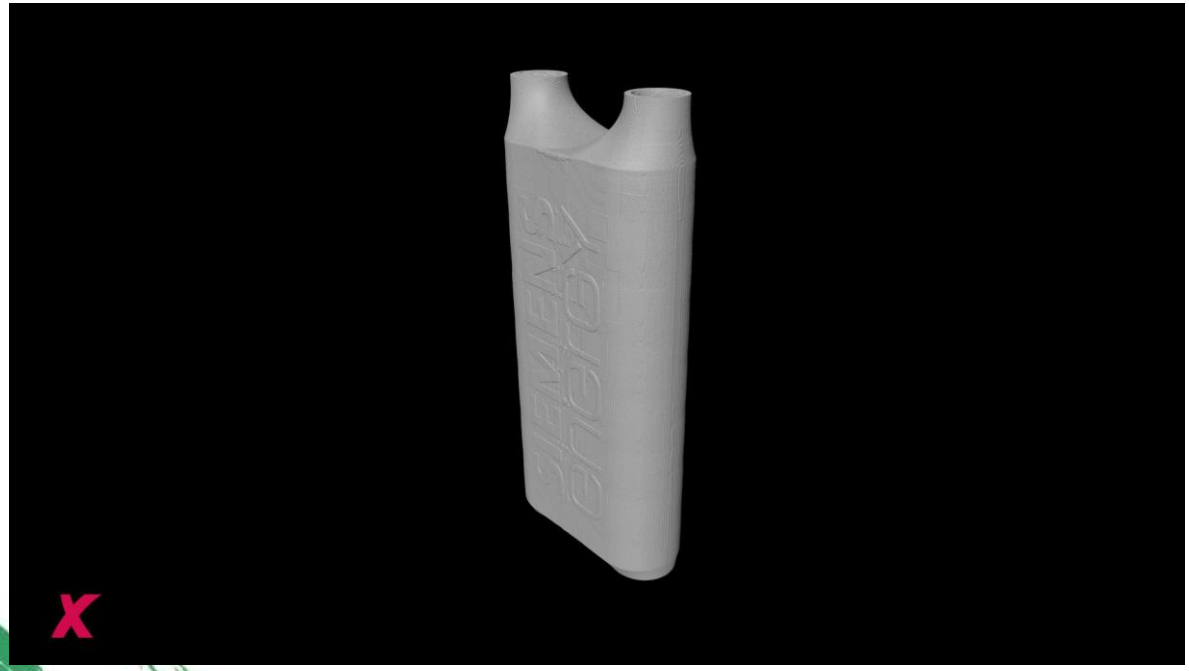


Image credit: Christoph Heinze, Siemens Energy Global GmbH & Co KG and Jussi-Petteri Suuronen, Xploraytion GmbH.

Siemens Energy wanted to see inside their additive manufactured objects:

- Unique design for higher efficiency
- Lower materials waste
- Recycling of powders

Xploraytion as CT experts imaged a 3D printed heat exchanger at ESRF:

- Study the internal surfaces
- Quality control of manufacturing process
- Identification of manufacturing defects

Funded by the European Union
UK Research and Innovation
Project funded by

VISIBILITY TO DEEP TECH SMES

LINKING WITH STAKEHOLDERS: ESRF SERVICES FOR EIC BENEFICIARIES

EISMEA

Initial Expert Consultancy

- **Respond to industrial R&D needs/questions** using cutting-edge X-ray characterisation techniques
- **Remote one-on-one** or group meetings
- **Free of charge**

Fast Track Access to X-ray Services

- **Quick access to advanced X-ray techniques** for routine materials and products characterisation
- **Measure sample structures** at different scales, from atomic to macro, whilst being non-destructive

Tailor-made Support and Experimentation

- **Build a tailored support** and exploitation of synchrotron X-ray techniques for a longer-term R&D support
- **Specific experiment environments**, set-ups


Photo ABML4

Photo by Meritt Thomas on Unsplash

Photo by Rendy Novantino on Unsplash

Tetra Pak®

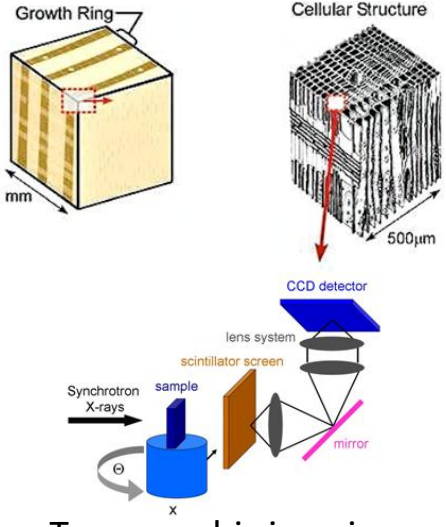
Photo ABML4

Wood – from Logs to Lignin Molecules

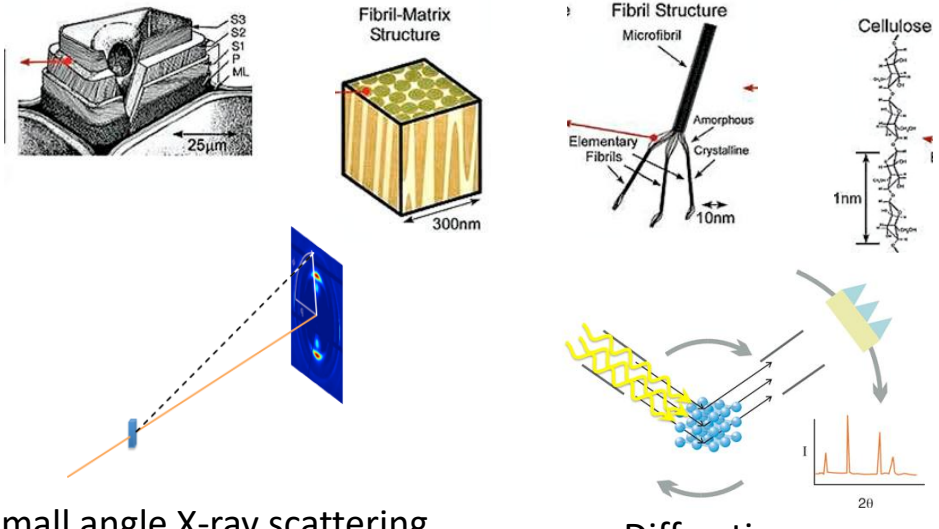
Wood is a hierarchical multi-scale raw material

DanMAX SoftiMAX **ForMAX** NanoMAX coSAXS Balder

10^{-3} m 10^{-6} m 10^{-10} m



Tomographic imaging



Small angle X-ray scattering SAXS

Diffraction

TREESEARCH

“Collaboration on the research on new materials from the forest”

OPEN: November 2022

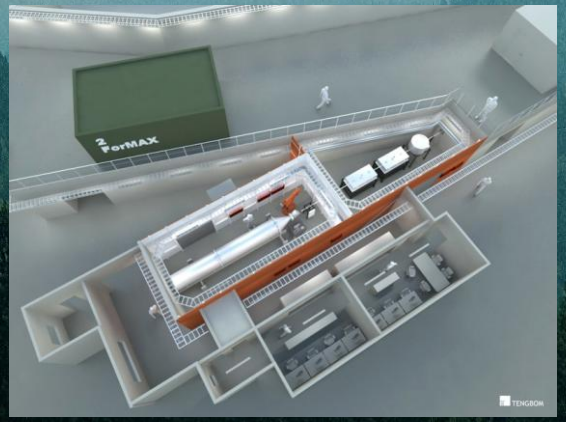
CHALMERS · KTH · LINKÖPING UNIVERSITY · Mittuniversitetet · AHLSTROM MUNKSJÖ · BILLERUDKORSNÄS · HOLMEN · stora enso · SCA · SÖDRA

Knut och Alice Wallenbergs Stiftelse

ForMAX:

- Supports R&D on biocomposites, nanocellulose, modification of wood, the pulping process, fibre ultrastructure and fibre-fibre bonding
- Provides advanced material characterisation, including complex real-time processes
- Contribute to the Swedish forest industry competitiveness (paper/pulp industries – Tetra Pak).

Joint funding from Wallenberg Foundation and industry



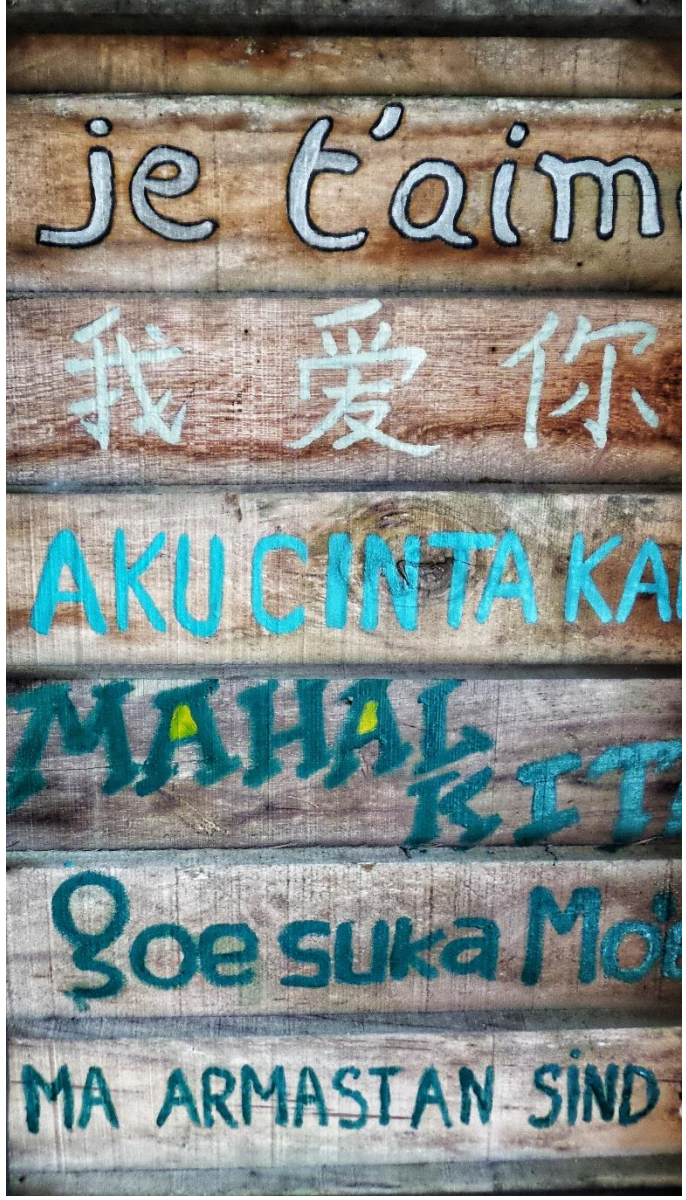
“ForMAX”

SAXS/WAXS/tomo beamline

https://treesearch.se/en/research-infrastructure/formax/

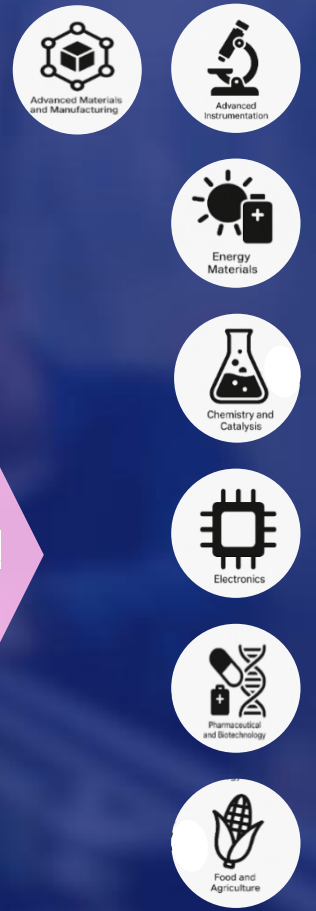
MAX IV

Outreach.
Translation.
Matching.
Common understanding.

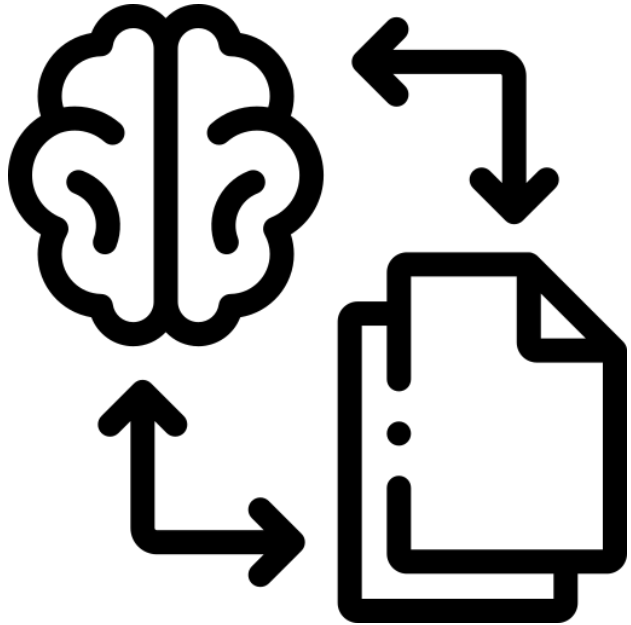


ESRF at the heart of the innovation ecosystem

- 300 clients over last 5 years
- 800 commercial services in 2025
- 4.5M€ commercial income 2025



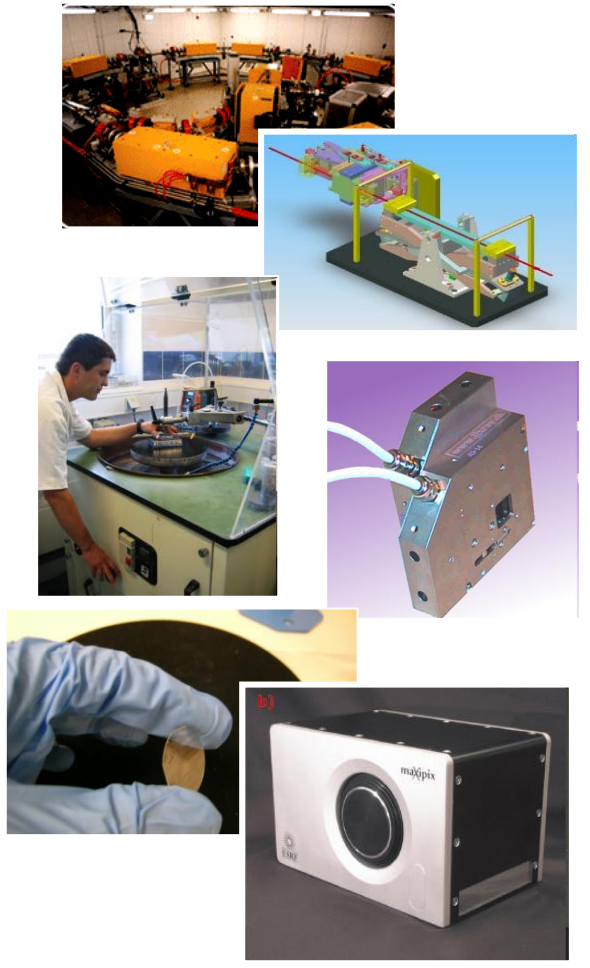
Technology and Knowledge Transfer



EXPLOITING SYNCHROTRON IP AND SKILLS

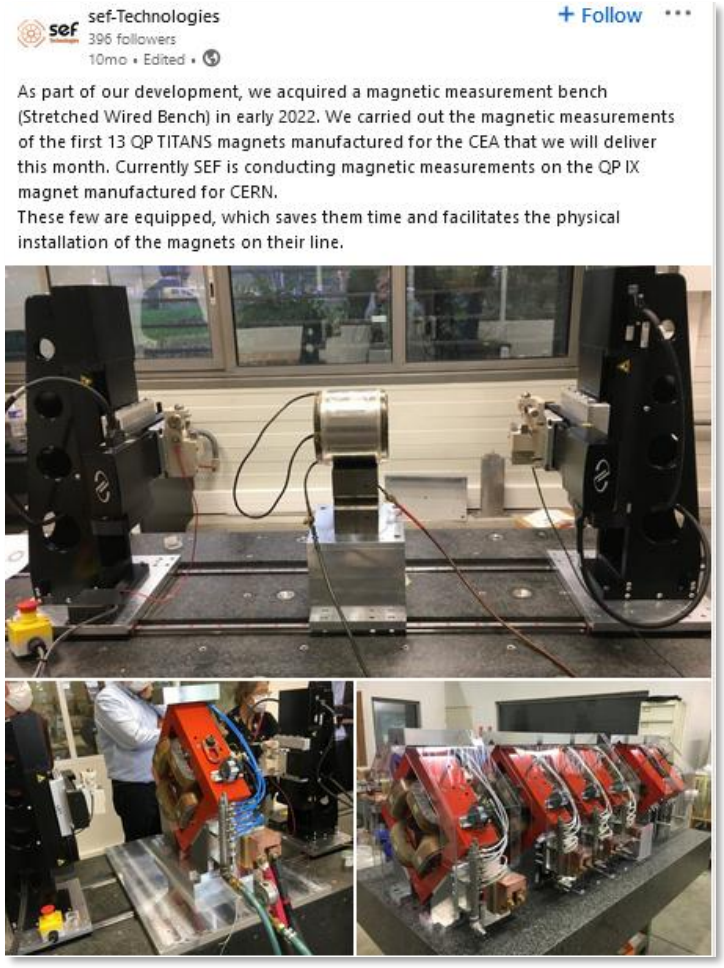
- Sharing and licensing technologies and instrument designs
- Manufacturing unique equipment
- Engineering consultancy
- Clear IP rules on experiment results
- Patents are not a (my) favourite tool

Being active in international, regional and local TT networks and incubators.



sef Technologies

KTT action.
Trust.



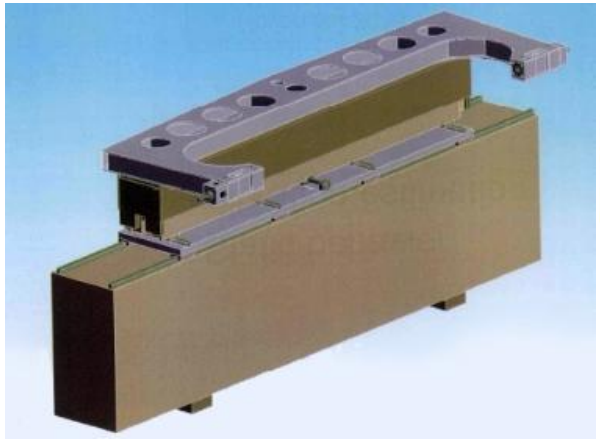
ALBA

Magnetic measurements laboratory at ALBA Synchrotron

In addition to synchrotron light laboratories, ALBA has a set of highly specialised laboratories offering their expertise to external clients

EQUIPMENT

- ❑3D Hall probe bench
- ❑Flipping coil bench
- ❑Rotating coil bench
- ❑Helmholtz coils
- ❑Fixed stretch wire bench



Magnetic measurements laboratory at ALBA Synchrotron

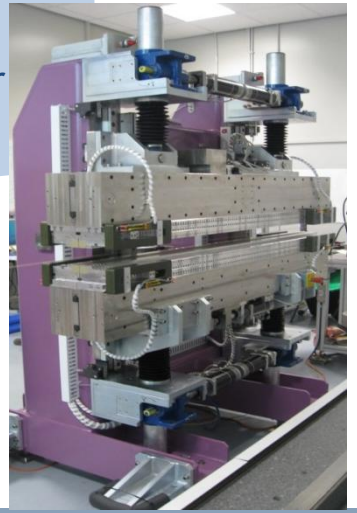
SERVICES

- Accurate magnetic measurements (100 ppm) of high magnetic fields (1 to 2 T) of big structures (up 2 m long).
  - Measurement of coils for motors or other applications
  - Measurement of field maps of any type of magnetic structures
  - Measurement of multipole magnets (quadrupoles, sextupoles, etc.)
  - Measurement of pure permanent magnetic blocks, isolated or assembled in holders, and sorting and shimming for constructing insertion devices
- Modelisation and optimisation of magnetic designs using 3D simulation tools
- Calculation of main features of measured magnetic fields (integrals, high order harmonics and fiducialisation of magnetic fields with respect mechanical references)

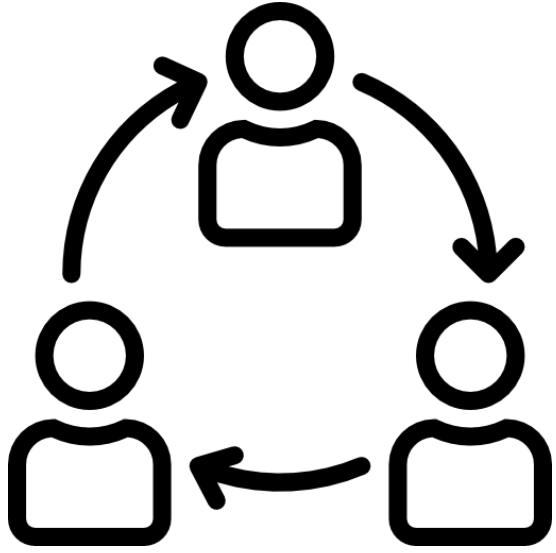
Dipole magnet

Multipole magnet

Undulator



Collaborating and Partnering with Industry

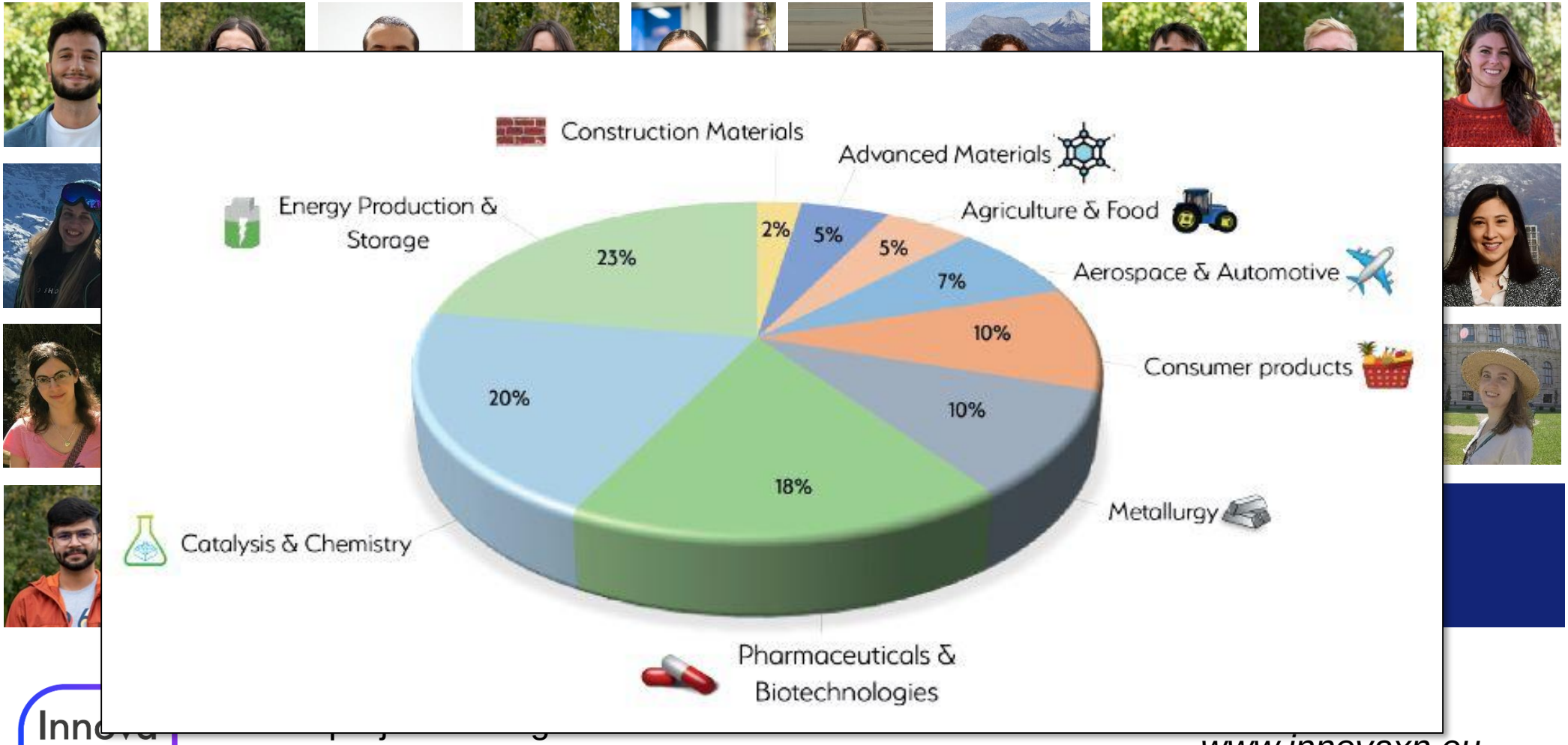


Innova XN

40 PhD projects using ESRF & ILL
40 industry partners driving the research challenges
Next generation ambassadors

www.innovaxn.eu

ESRF The European Synchrotron
NEUTRONS FOR SOCIETY
UGA Université Grenoble Alpes
Marie Skłodowska-Curie Actions



40 industry partners driving the research challenges
Next generation ambassadors

www.innovaxn.eu

WORKING WITH INNOVATION ECOSYSTEM PARTNERS

NANOELEC.

A French-funded Public-Private Partnership 450M€

www.irtnanoelec.fr

Funded a "Pathfinder Programme" to create a better interface between the Grenoble-based facilities, ESRF, CEA-LETI, ILL and the nano/micro-electronics industry.

1. **Sample preparation tools**
2. **Instrumentation development**
3. **Proof-of-concept**
4. **Business development**

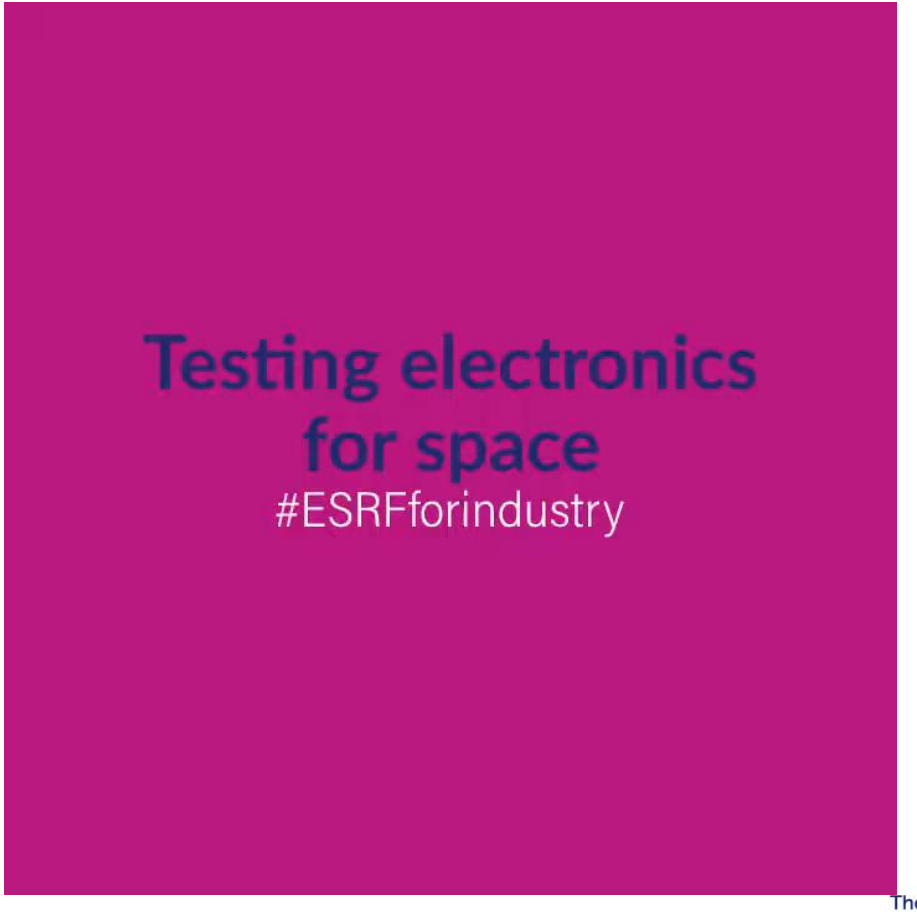
TESTING INTEGRATED CIRCUITS FOR AIRBUS

Aerospace

National Funding

PRECISE FAULT INSERTION – BLINE ID09

Airbus has come to the ESRF to test how well electronic devices used in satellites can sustain cosmic radiation.



Stakeholder and EU support is critical.

Facility engagement is key.

Outreach, outreach, outreach.

Extended ESRF
Business Development Office
Team

Follow us:
esrf-for-industry

industry@esrf.eu

Thank you for your attention

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Head of Business Development
mitchell@esrf.eu
www.linkedin.com/in/e-mitchell