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# Innovation and Tech Transfer

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 iPhone



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Who produced it?



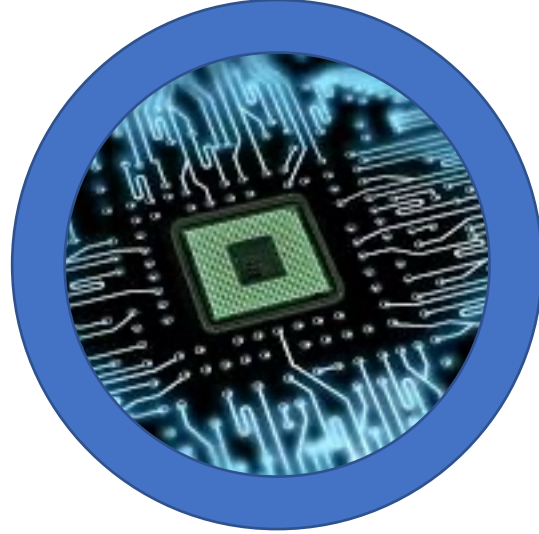
FOXCONN  
鴻海科技集團

Who designed it?



What's behind the scenes?



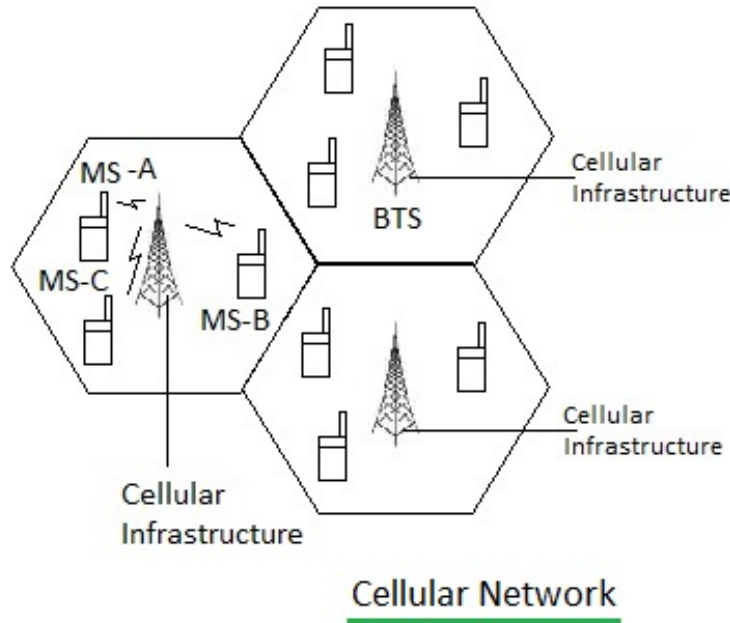


## Microchips

- **Microchips** powering the iPhone owe their emergence to the U.S. military and space programs, which made up almost the entire early market for the breakthrough technology. In the 1960s, the government bought enough of the initially costly chips to drive down their price 50x in a few short years, enabling numerous new applications.







## Cellular Network

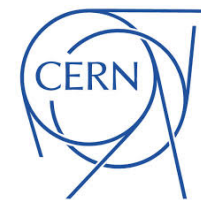
- The early foundation of **cellular communication** lies in radiotelephony capabilities advanced throughout the 20th century with support from the U.S. military.

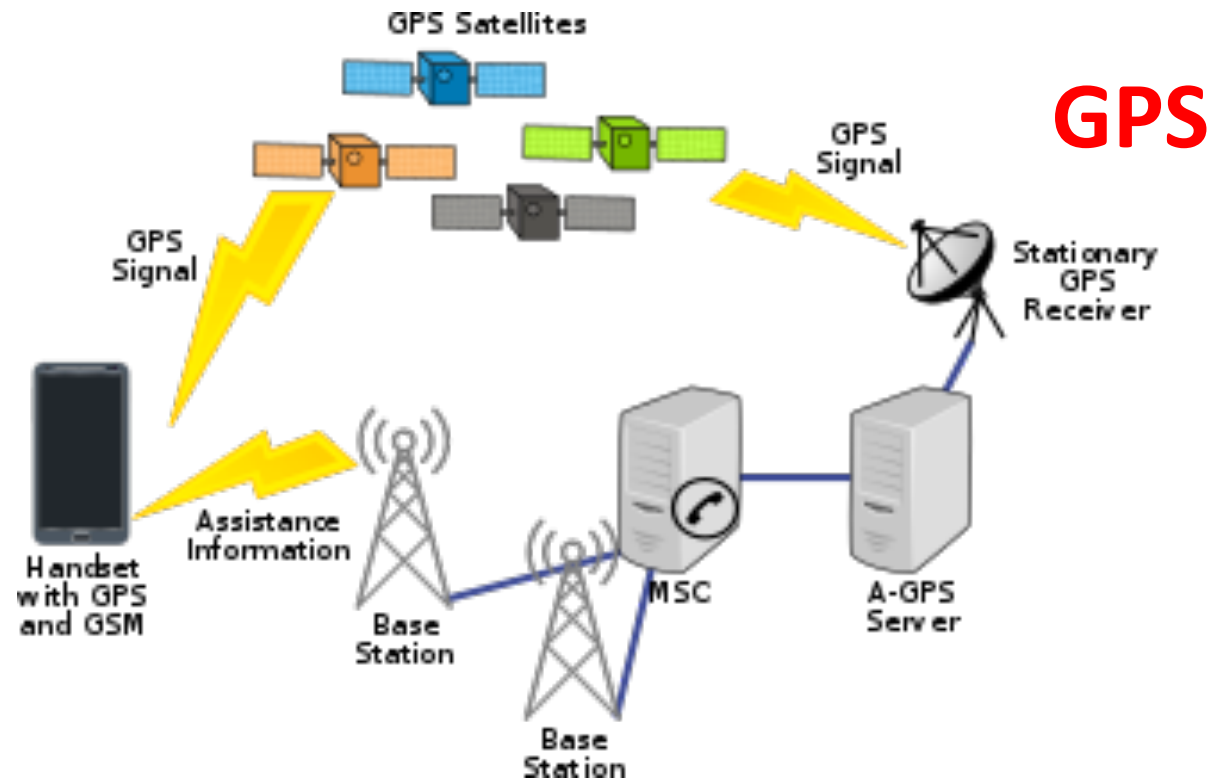




## Internet

- **The technologies underpinning the Internet,** which gives the “smart phone” its smarts, were developed and funded by CERN (WWW) and the Defense Department’s Advanced Research Projects Agency in the 1960s and 70s.





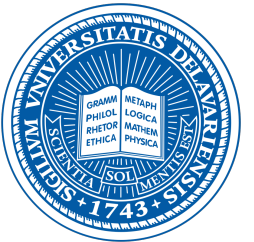
- **GPS** was created/deployed in 1980s/90s by the military's NAVSTAR satellite program and still today maintained via public funds





## Multi-touch Display

- The **multi-touch display** that makes using an iPhone so intuitive has US government's fingerprints all over it. The revolutionary interface was first developed by a brilliant pair of University of Delaware researchers supported by NSF and CIA grants







**SIRI**

- › **SIRI**, iPhone 5s personal assistant, developed initially in DARPA.



Source: Mazzucato (2013) and The Breakthrough Institute: Where Good Technologies Come From?, 2011



Steve Jobs introduces iPhone in 2007

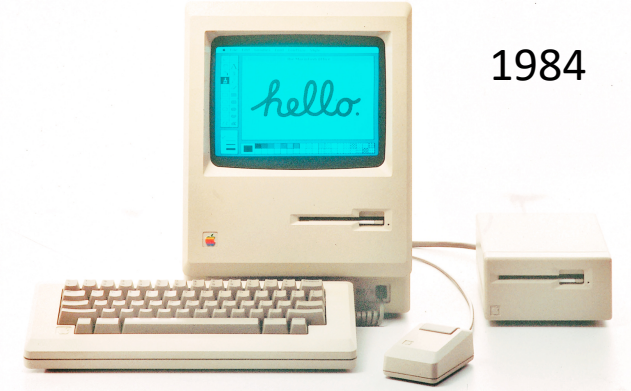
<https://www.youtube.com/watch?v=MnrJzXM7a6o>



XEROX

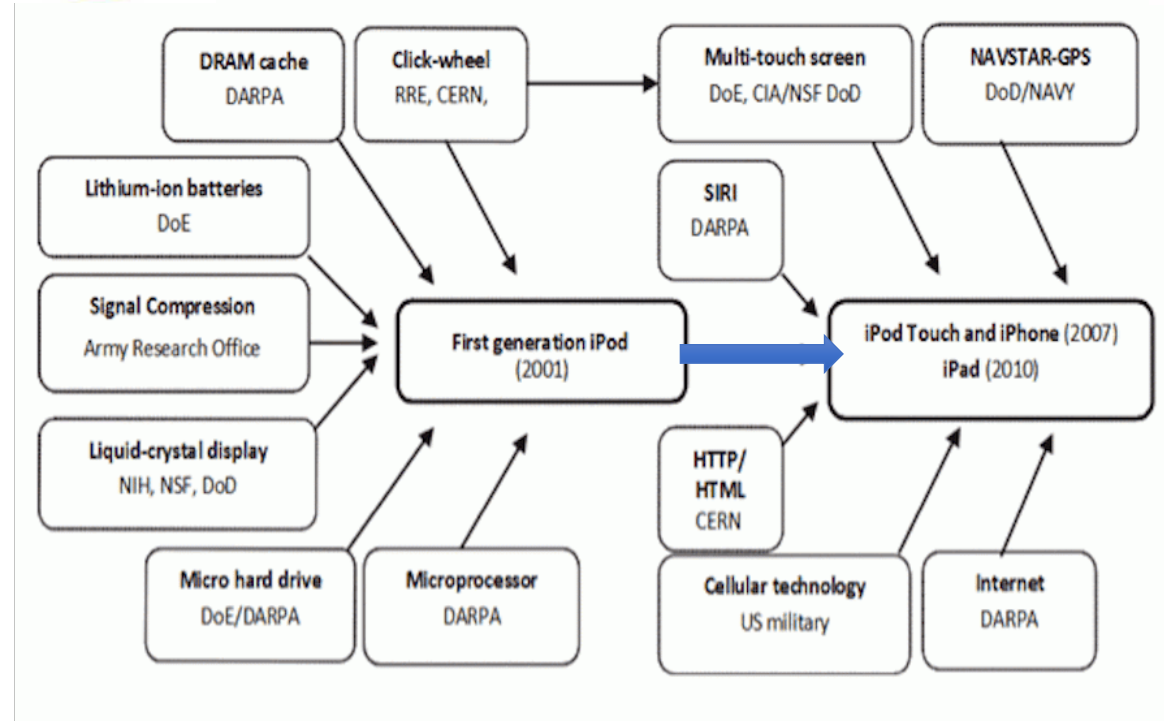
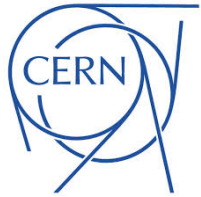
PARC

Laser Printers GUI, Ethernet



1984

Microprocessor, RAM,

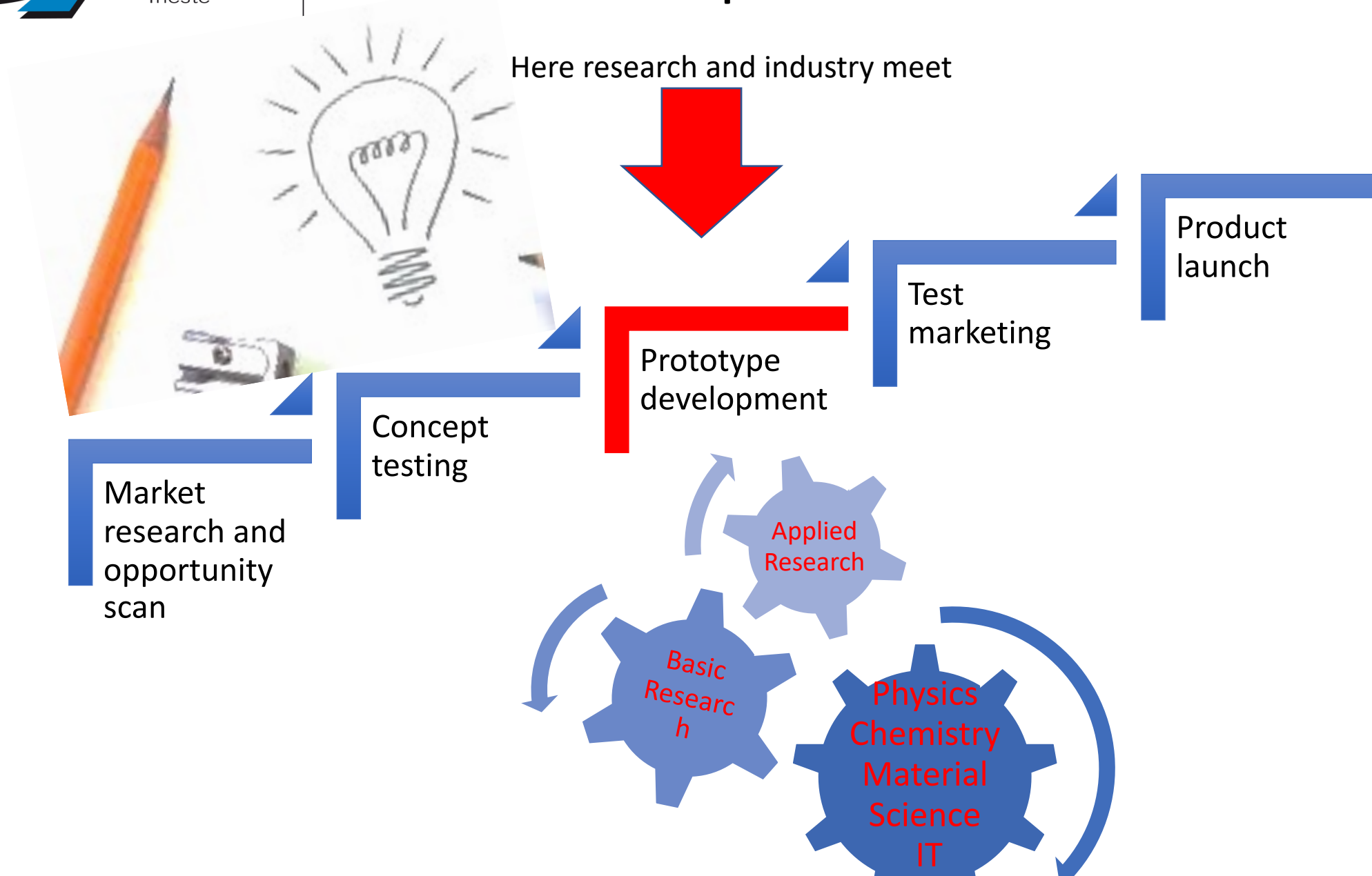


2007



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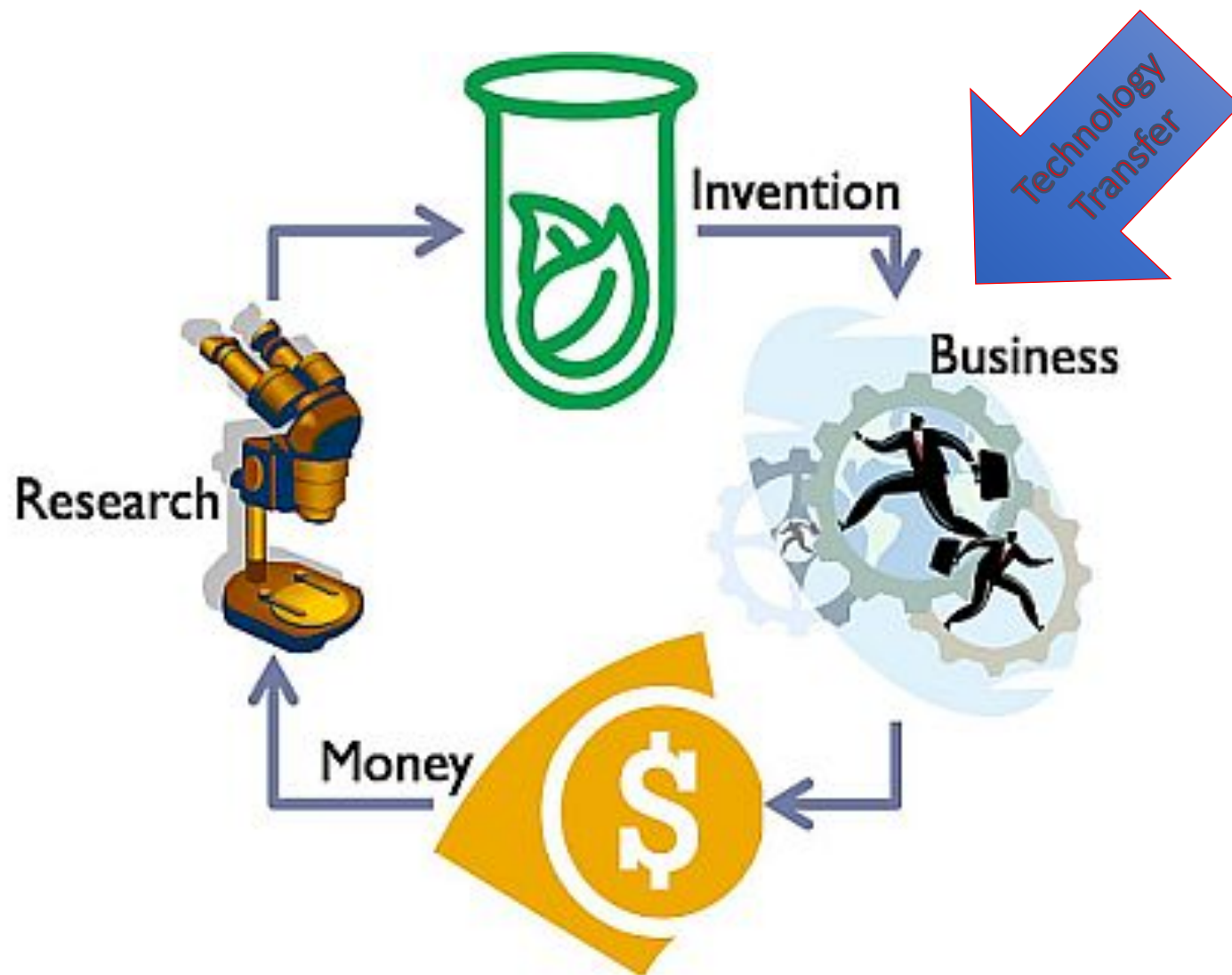
# From Idea to product





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# Value for Research



## Technology Transfer

Interfaceing research and industry is a real job that must be done by professionals capable of interpreting industrial needs and translating them into the language of research to obtain effective results.



# Research Infrastructures

In a Research Infrastructure you'll find:

- Multi-disciplinary environment
- Leading edge technologies
- Open knowledge
- Several application fields
- Cross-fertilization



A Research Infrastructure can provide:

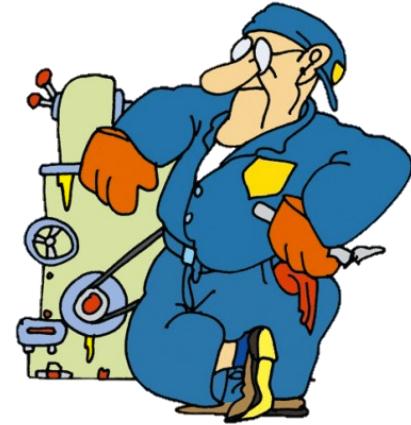
- Know how
- Services
- Products

... to any company

# What is “Service”

A company needs:

- Infrastructure / Measurements
- Researcher expertise / Measurement analysis
- Mainly requires... SOLUTIONS



Scientific Solution  $\neq$  Industrial Solution



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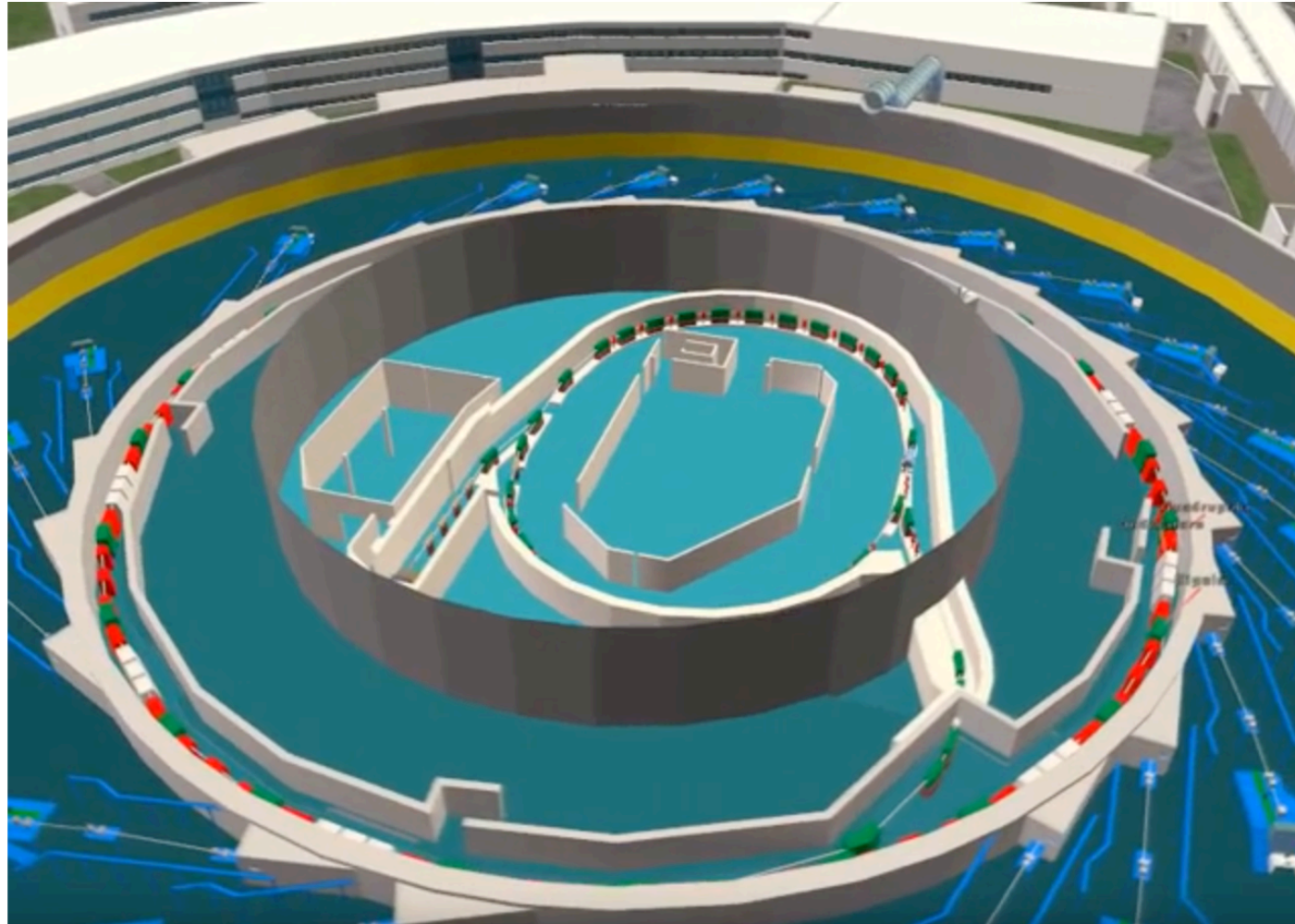
- 400 employees
- 34 beamlines
- 12 support labs
- 5000 hours /year
- more than 1500 scientists from more than 52 countries





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# Elettra. What is a synchrotron? How does it work?



<https://www.youtube.com/watch?v=l4NSF-gkKCU&t=12s>



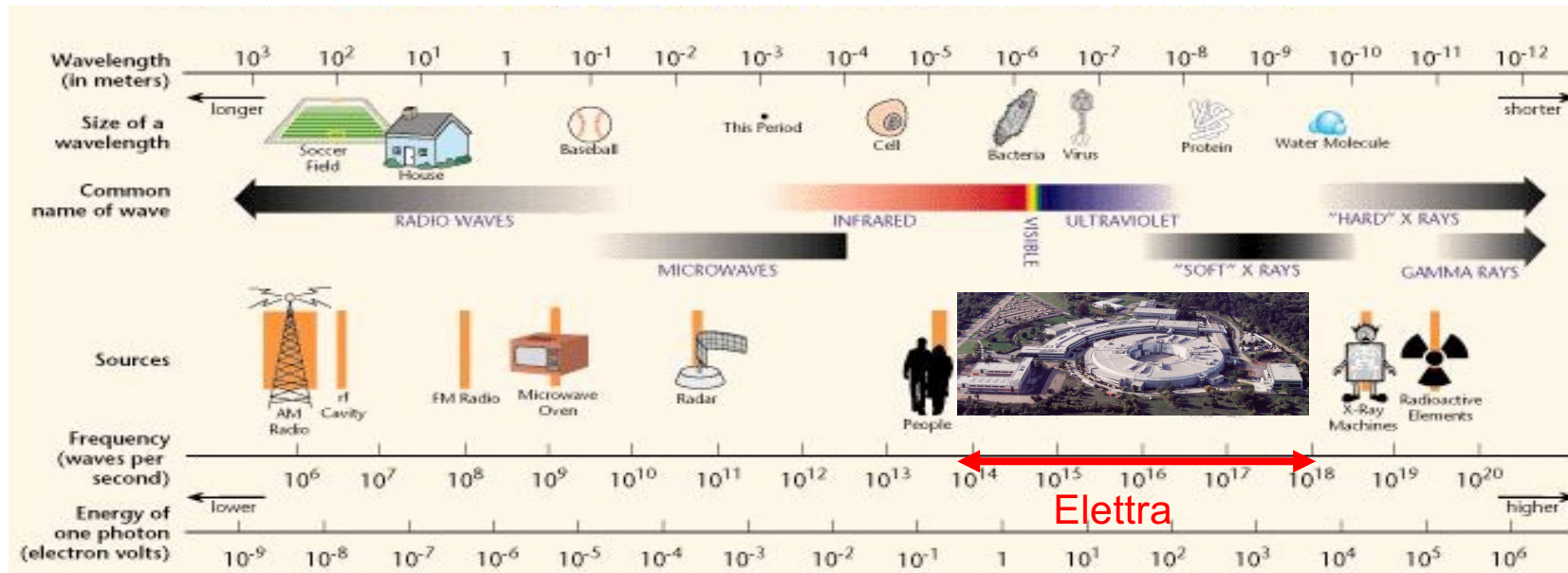
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# Synchrotron light properties

High brilliance

Wavelength tunability

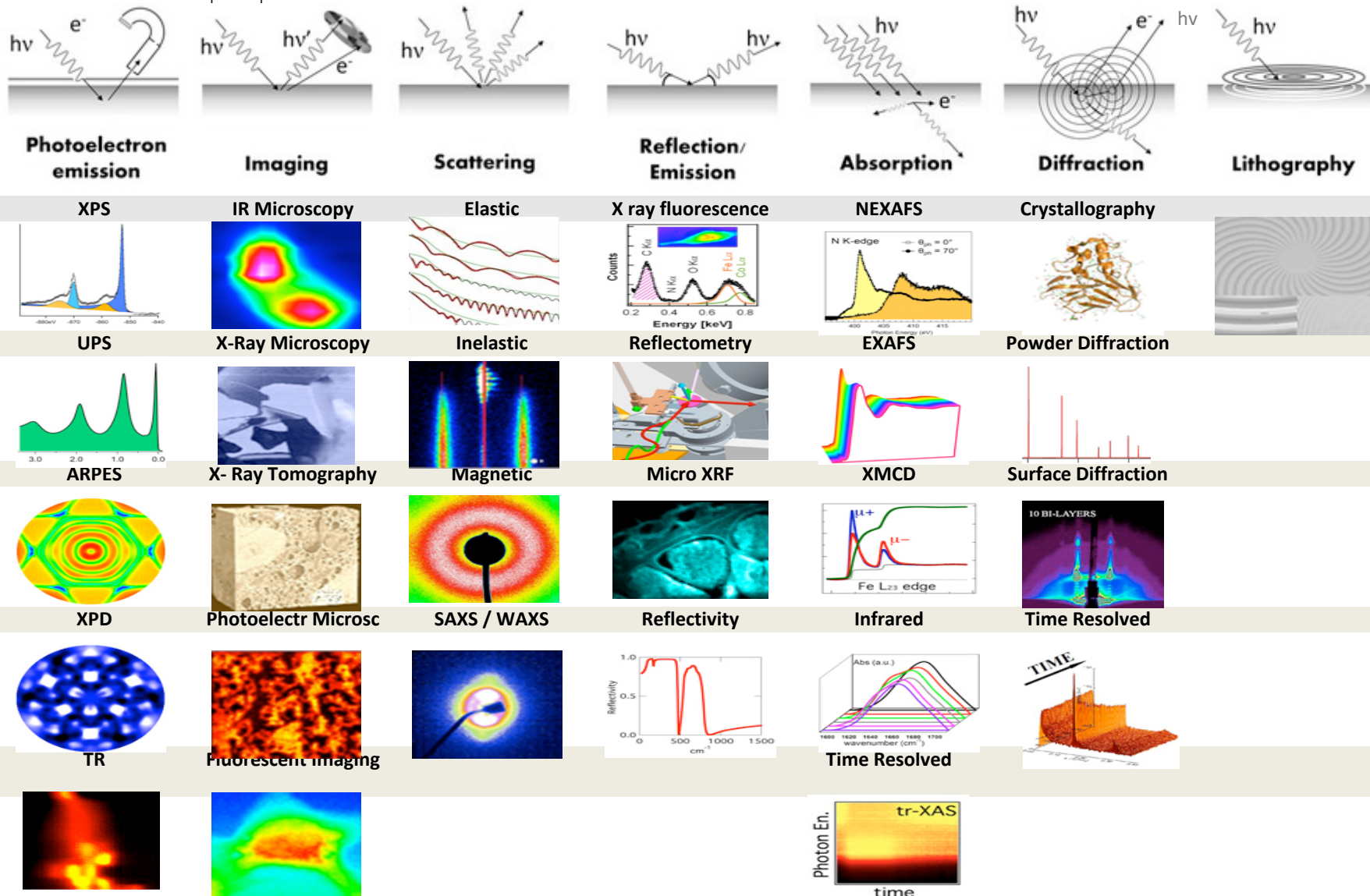
Coherent and collimated light





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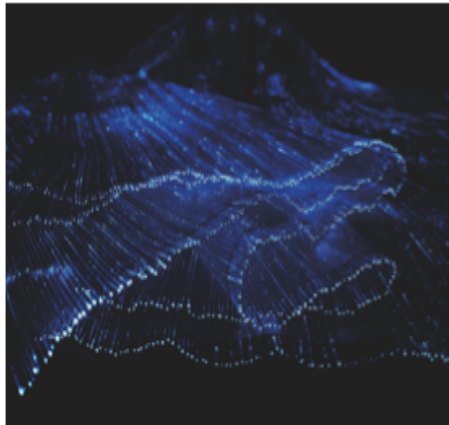
# Analytical Techniques available @Elettra





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# Industrial Liaison Office@Elettra



Primary  
Activities



Scouting of  
Technologies

Intellectual  
Property  
Patents

Services to  
Companies

Scientific  
instruments  
production

Support  
Activities



Organization

Networking

Marketing





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# Applications

## Services

### » Agrofoodstuff



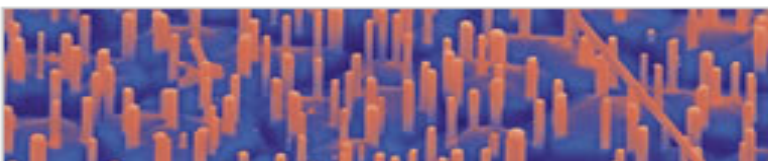
### » Conservation of the Cultural heritage



### » High-Tech Materials



### » Micro and nanotechnologies



### » Chemistry and Catalysis



### » Energy and the environment



### » Medicine and Diagnostics



### » Optics, Electronics and ICT







## Example #1

- Industrial Problem:
- Development of new magnetic guides for shelves instead of mechanical ones
- Scientific result:
- You need magnets with magnetic field like that: (description)
- Answer to the company:
- You need to buy “Rare Earth-Iron-Boride” Magnets sold by this company....



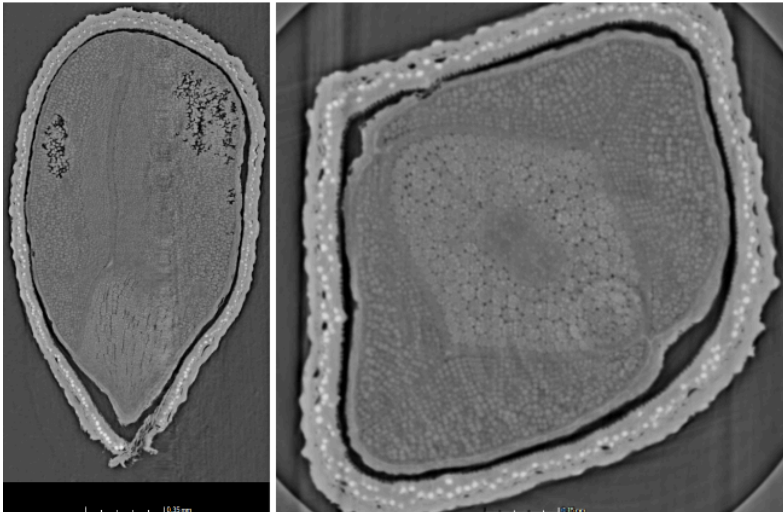
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## Example # 2: Morphology of Basil Seed using X- Ray Tomography



Basil Plants were infected by a pathogenic microorganism. Several investigation were made to find the source of contamination. Among those investigations, X- Ray Tomography was used to study the morphology of basil seed to evidence differences in contaminated/non contaminated basil seeds.

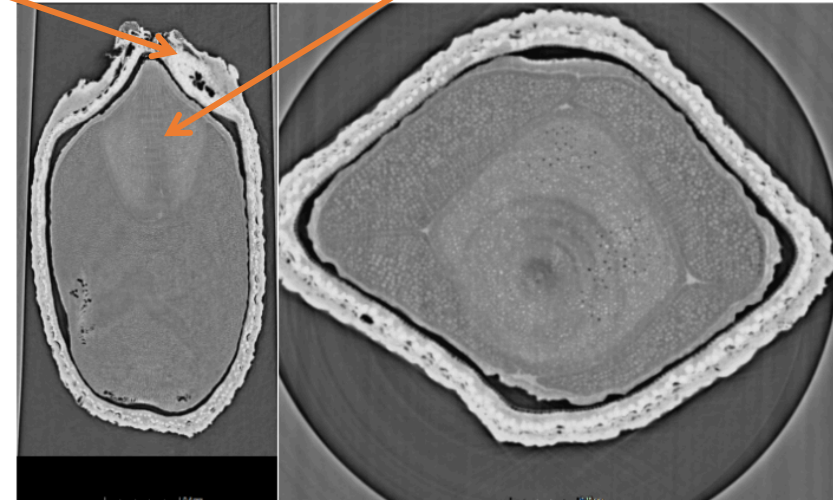
- Non contaminated -



Indented borders

- Contaminated -

Melted structure



# Example # 3: Morphology of Croissant using X- Ray Tomography



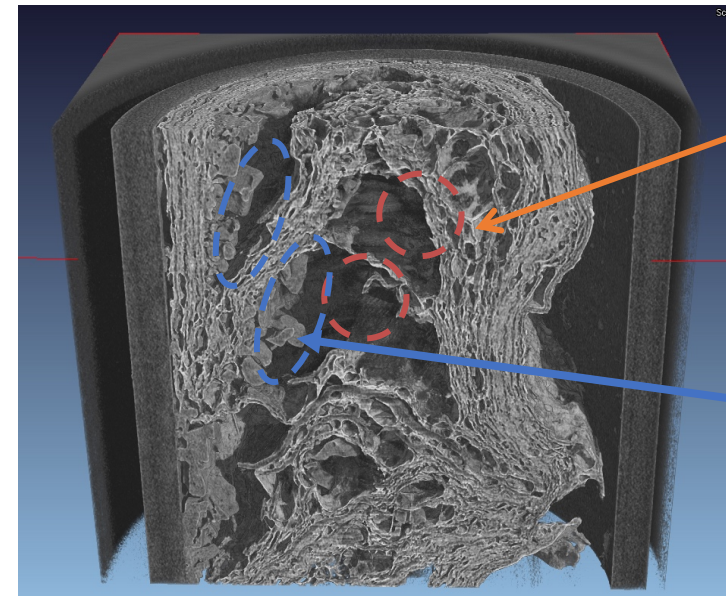
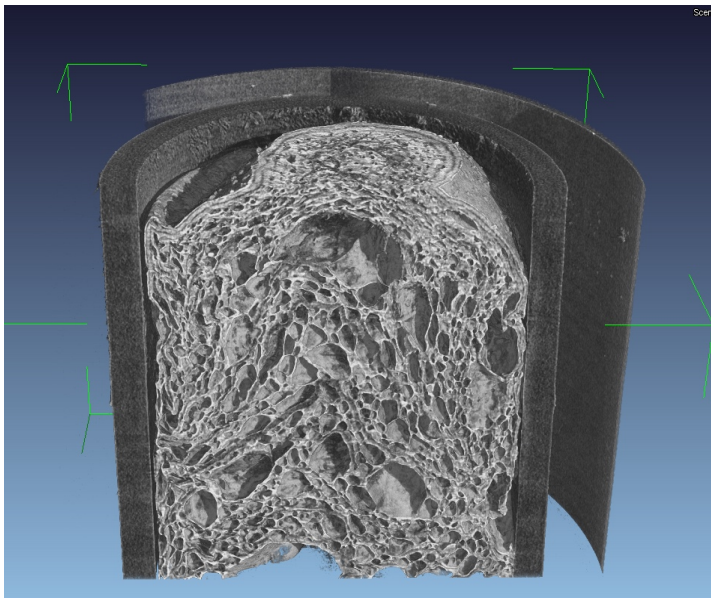
- 1 month freezer dough-



Different mixtures of croissant dough were refrigerated. Investigation were made to correlate good/bad results when cooked with different freezing procedures ( 1 month vs 6 months).

Presence of ice crystals in long term freezed dough are visible as well as several modification in the morphology.

- 6 month freezer dough-



Changes  
in  
structure

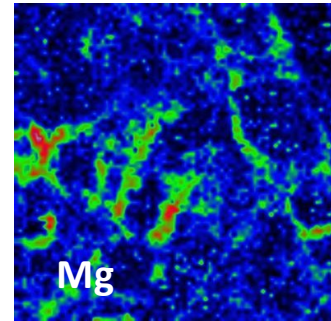
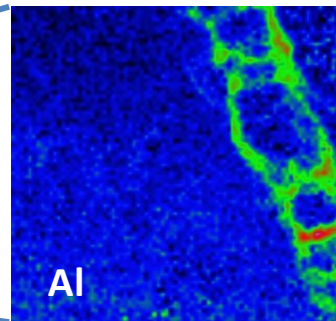
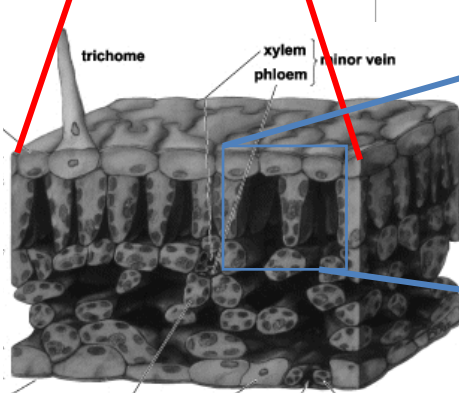
Ice  
Crystals



## Example # 4: Chemical analysis on Tea leaves

Metals have been found in tea leaves grown in contaminated soils.

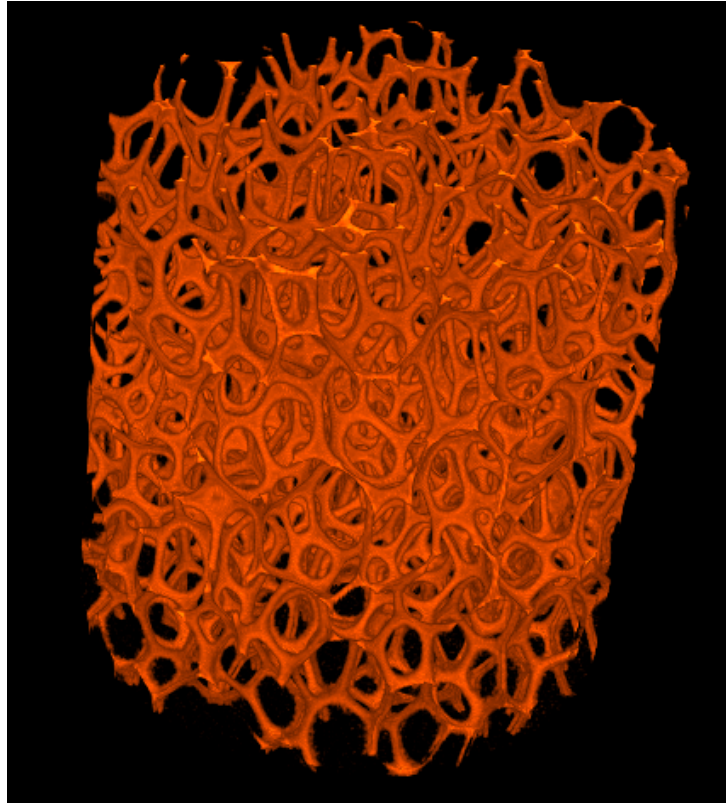
These studies lead to the phytoremediation technique to decontaminate the soils





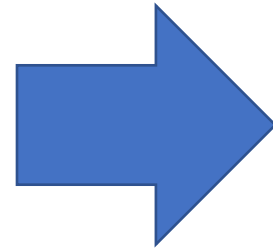
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## Example # 5: Tomography on Polymeric Foams



3D image

1 mm



Polymer foams have been designed to be optimized for specific applications

# Instrumentation: Electron Analyzers

Elettra has developed innovative technological components and has made them available to interested companies for the analysis of materials.







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# European Spallation Source

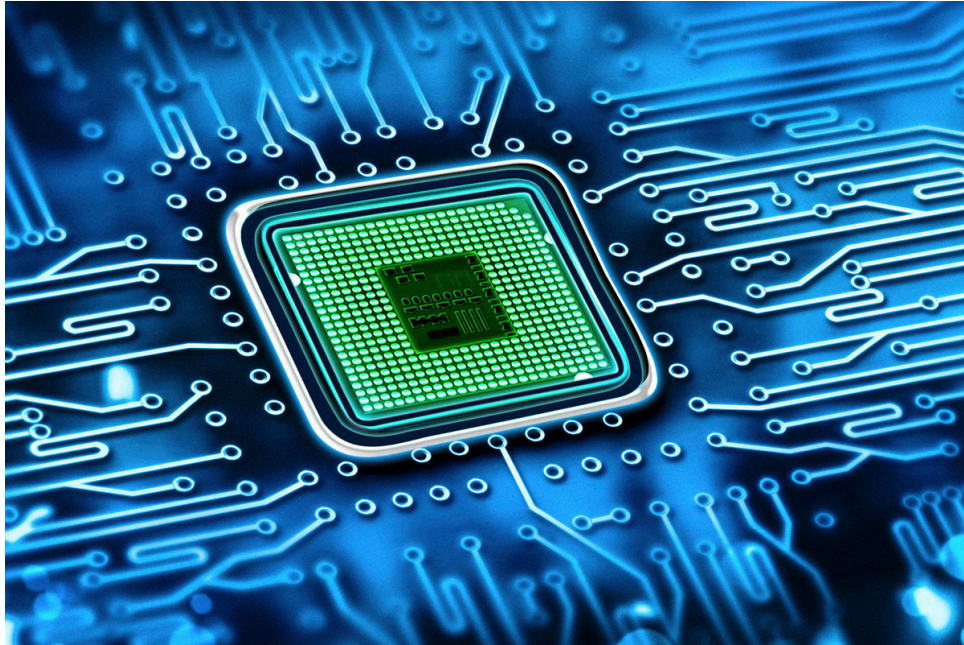


Elettra collaborates with other international research centers in the construction of a large research infrastructure in Lund (Sweden).



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# Semiconductor industry



ASML, the leading global manufacturer of chip-production equipment, decided to perform demanding tests with the cutting edge free electron laser FERMI. The cooperation has successfully pooled together the respective expertise, ensuring the best results while safeguarding the confidentiality.

# ASML