

# ESS & Regional Sources/CANS

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[www.europeanspallationsource.se](http://www.europeanspallationsource.se)

CANS DTU Nov 2016



# ESS construction status



milestone: 20% construction complete



# ESS construction status



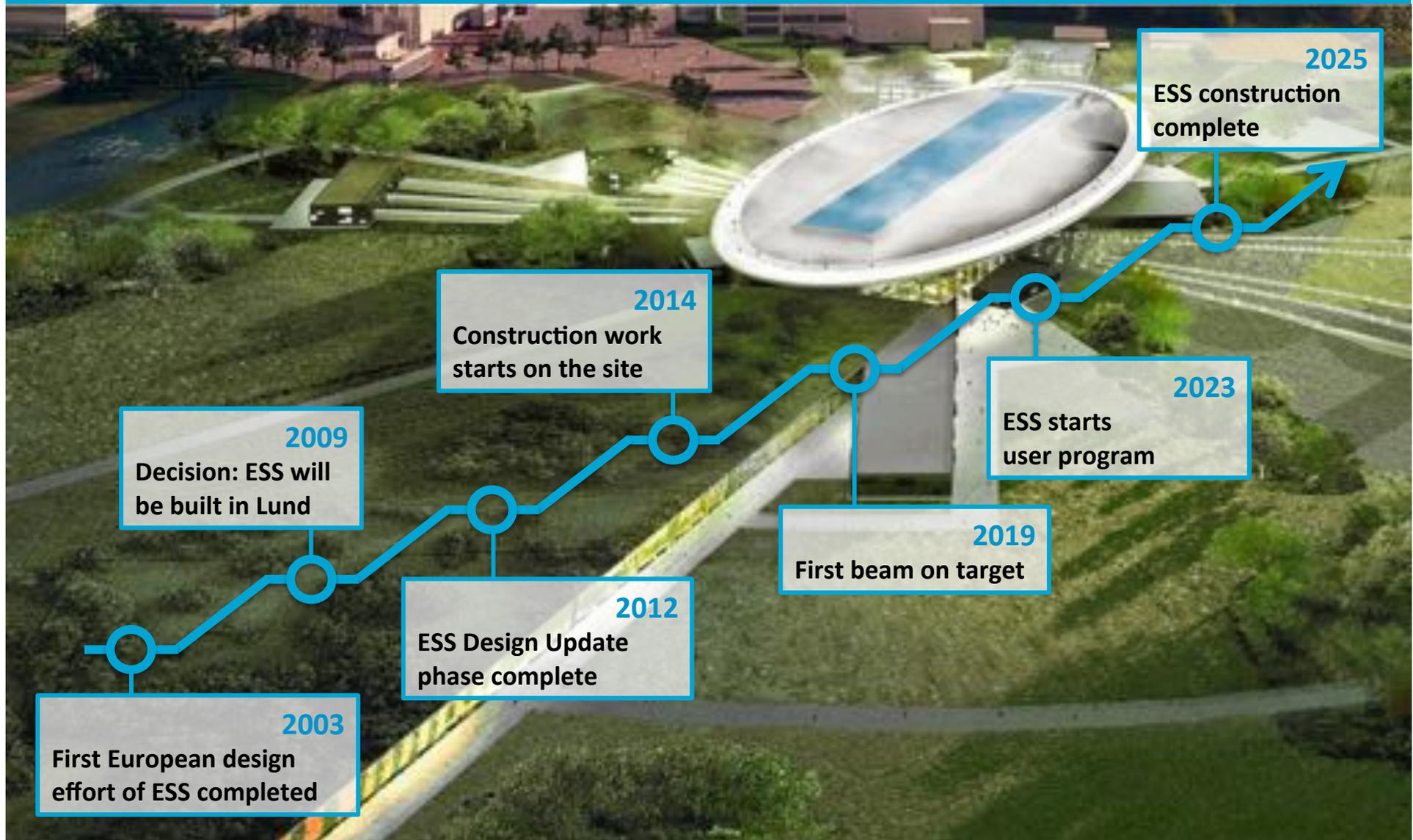
A recent milestone – tunnel ready for installations



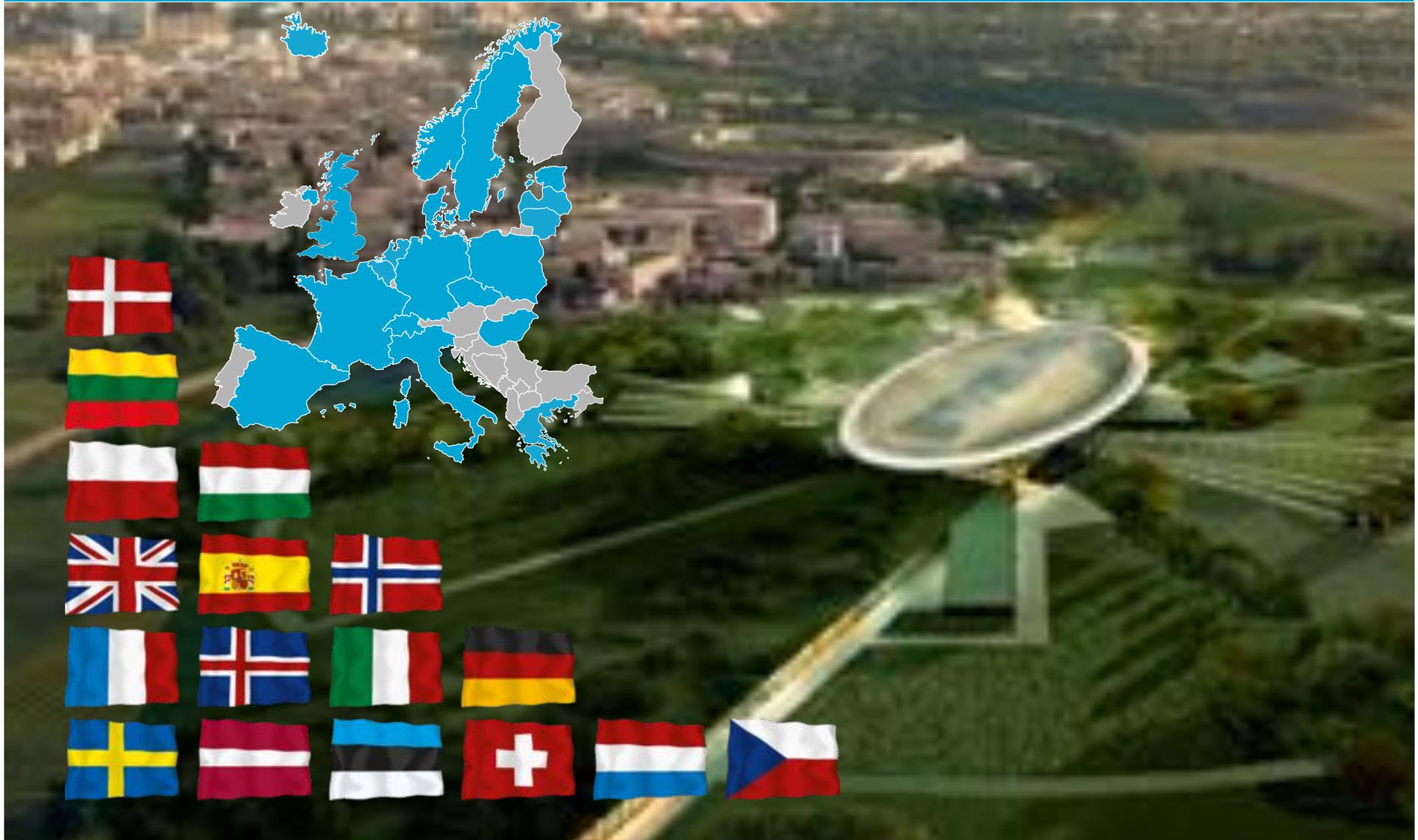
# ESS construction status



# ESS Timeline and Milestones



# ESS: A European Science Project



# Project Commitments

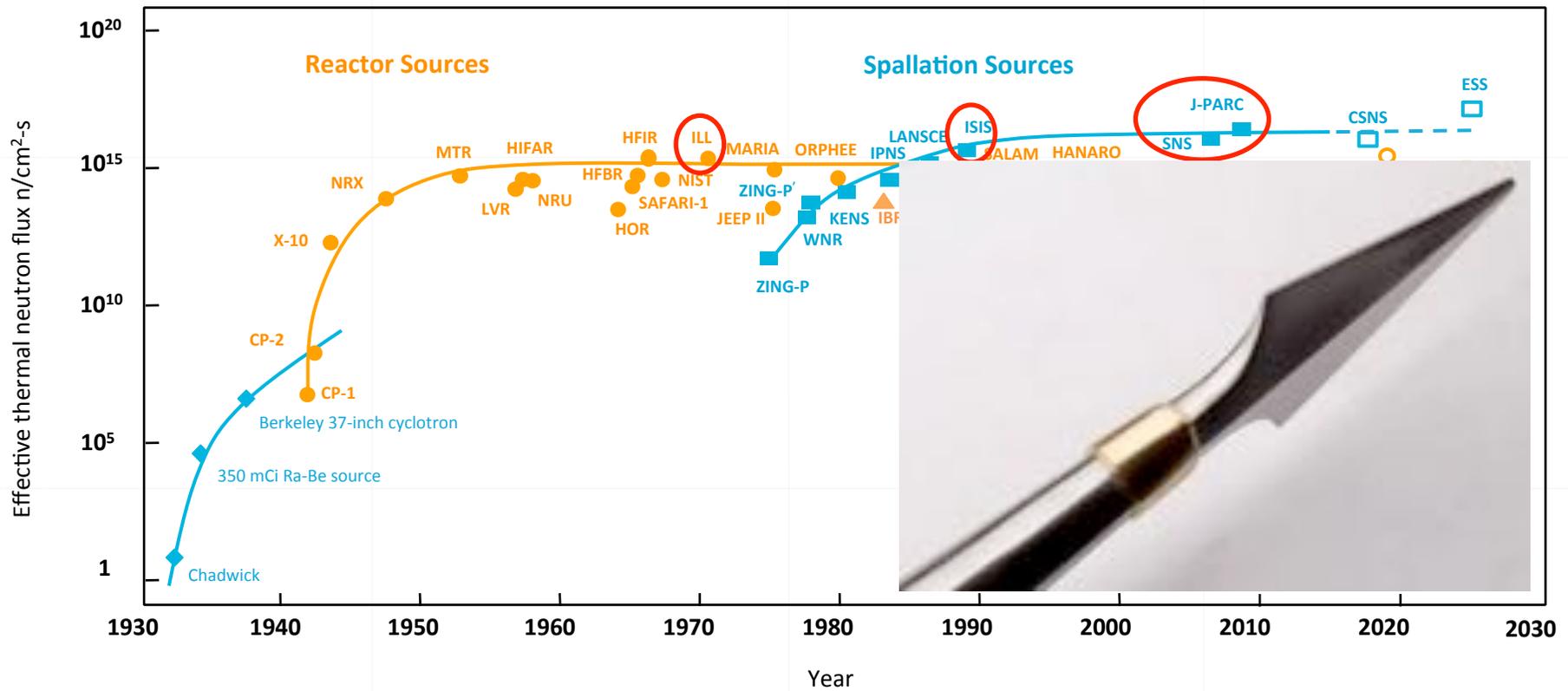


- 
- An aerial architectural rendering of the ESS facility. The central feature is a large, white, oval-shaped building with a blue-tinted roof, supported by a thick, white, T-shaped concrete pillar. The building is surrounded by a well-manicured green lawn with several paths. In the background, there are other buildings and trees, suggesting an urban or campus environment.
- ✓ 5 MW pulsed neutron source, brightest neutron source
  - ✓ 22 world leading instruments
  - ✓ Construction cost of 1,843 B€
  - ✓ Steady-State Ops at 140 M€/year

# ESS – New Generation Neutron Source



- ESS will be more powerful and brighter than existing sources



(Updated from *Neutron Scattering*, K. Skold and D. L. Price, eds., Academic Press, 1986)

# ESS – A science tool



1932: Chadwick discovers "a radiation with the more peculiar properties", the neutron.

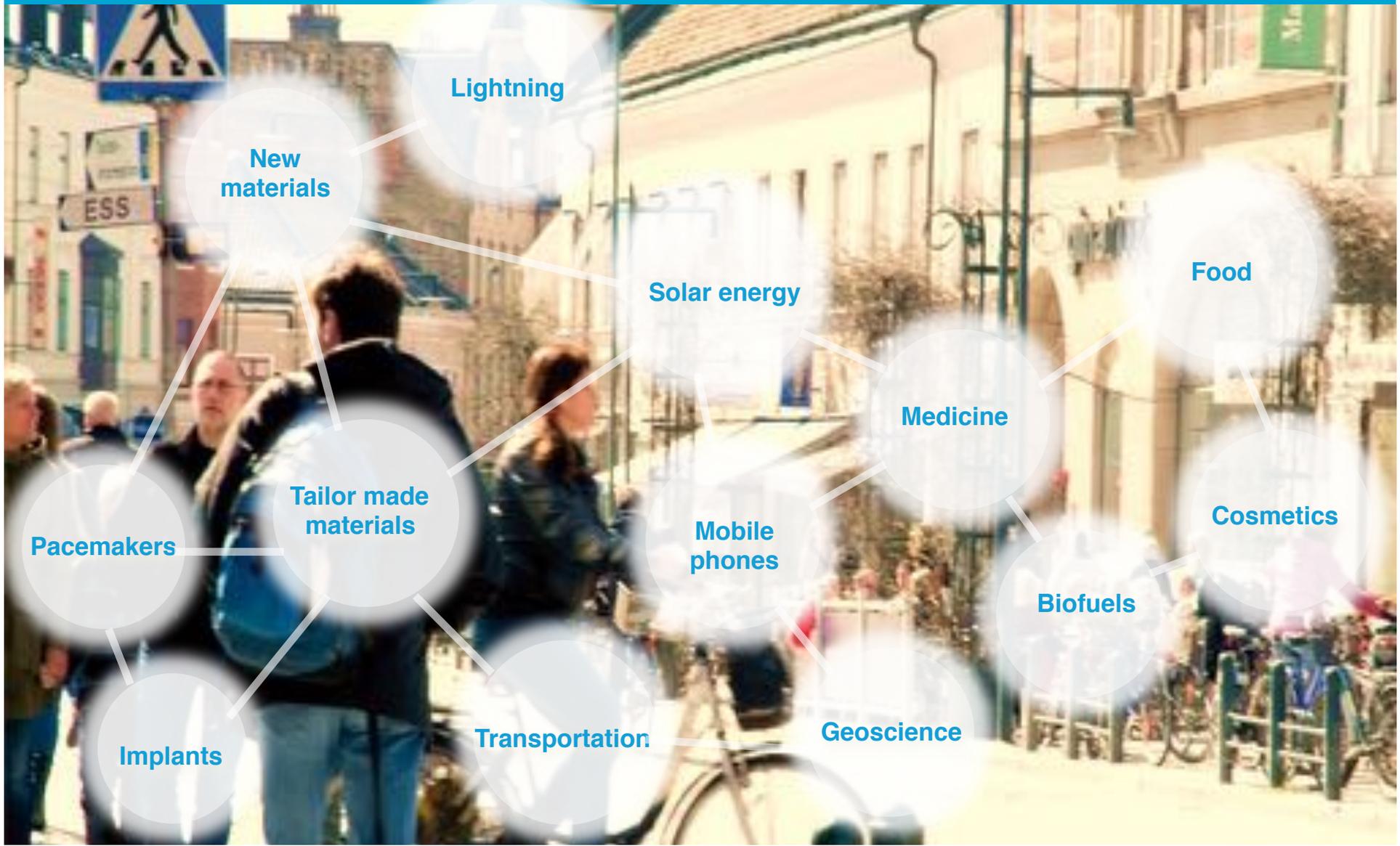
Cliff Shull: where are the atoms?



Bert Brockhouse: what do they do?



# ESS – A science tool



# ESS: Fundamental & Applied Research



Levitation of superconductor



Superconductivity  
Magnetism  
Crystallography  
Excitations  
Proteins

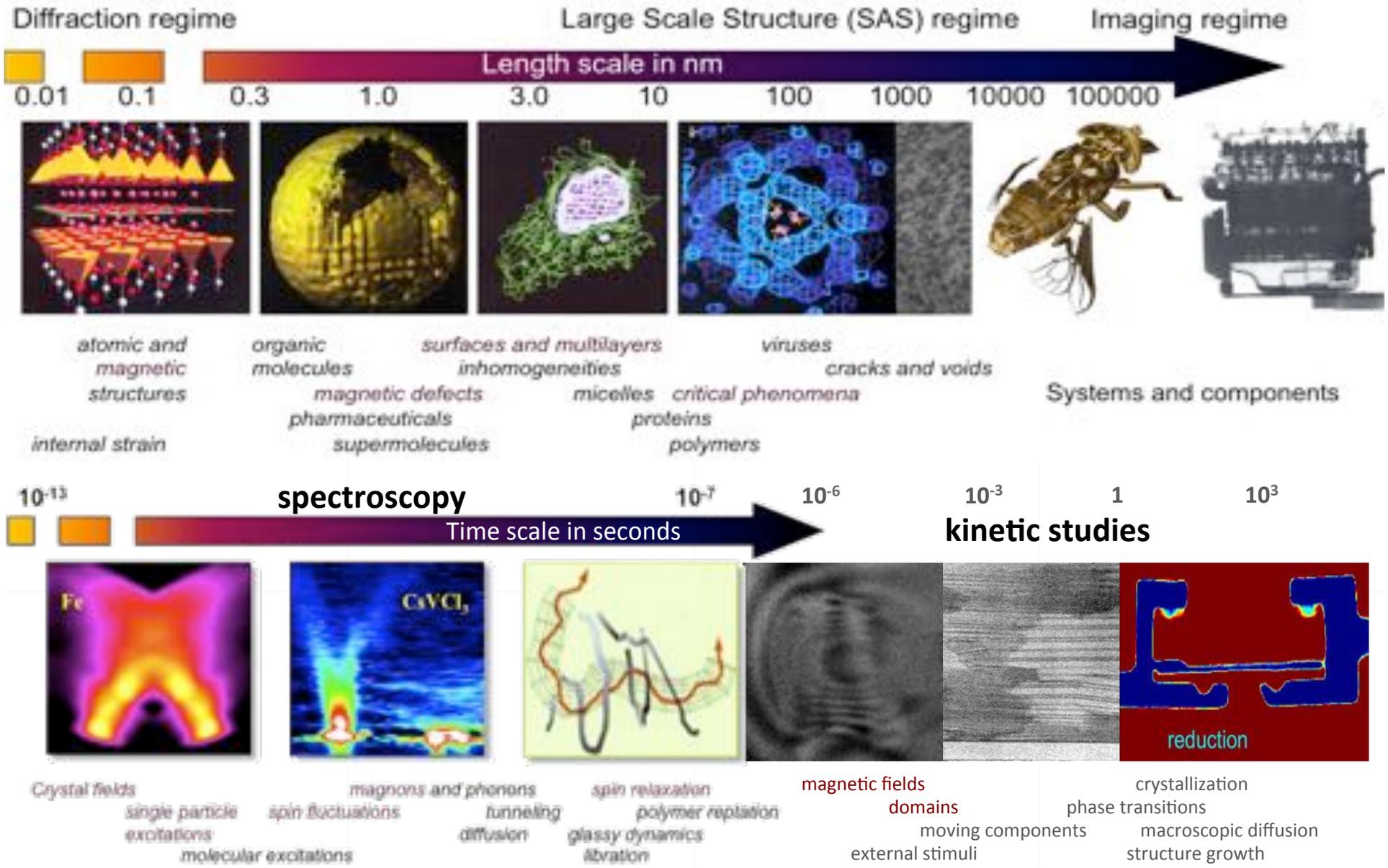
Levitation of normal conductor



Catalysts  
Engineering Materials  
Electronics  
Hydrogen economy  
Medicine



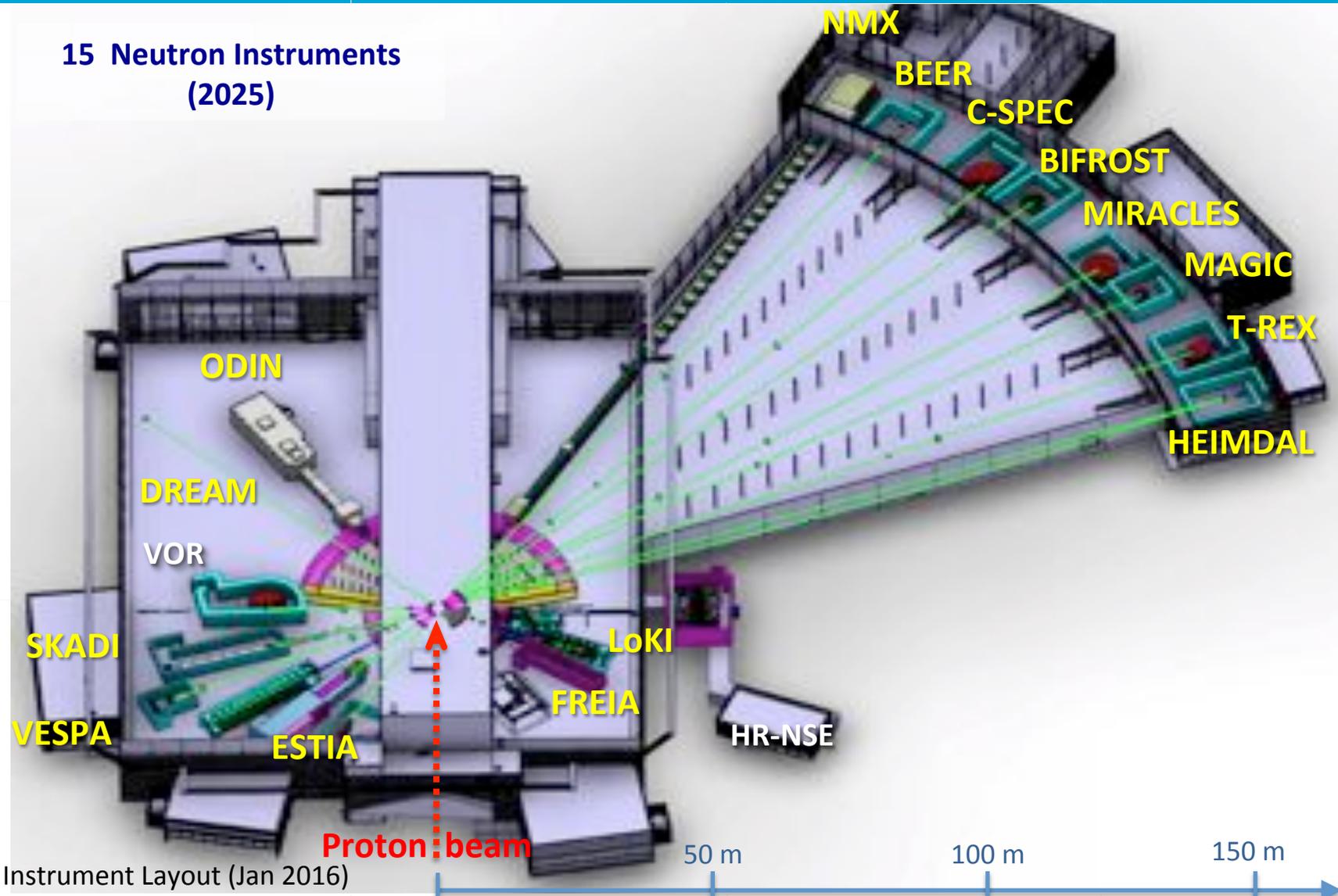
# But why neutrons, what can they do for us?



# The ESS Neutron Instruments



15 Neutron Instruments  
(2025)



# The ESS Neutron Instruments



Large-Scale Structures

ODIN	
SKADI	
LOKI	
Surface Scattering	
FREIA	
ESTIA	
HEIMDAL	
DREAM	
Monochromatic Powder Diffractometer	
BEER	
Extreme Conditions Diffractometer	
MAGIC	
NMX	

Diffraction

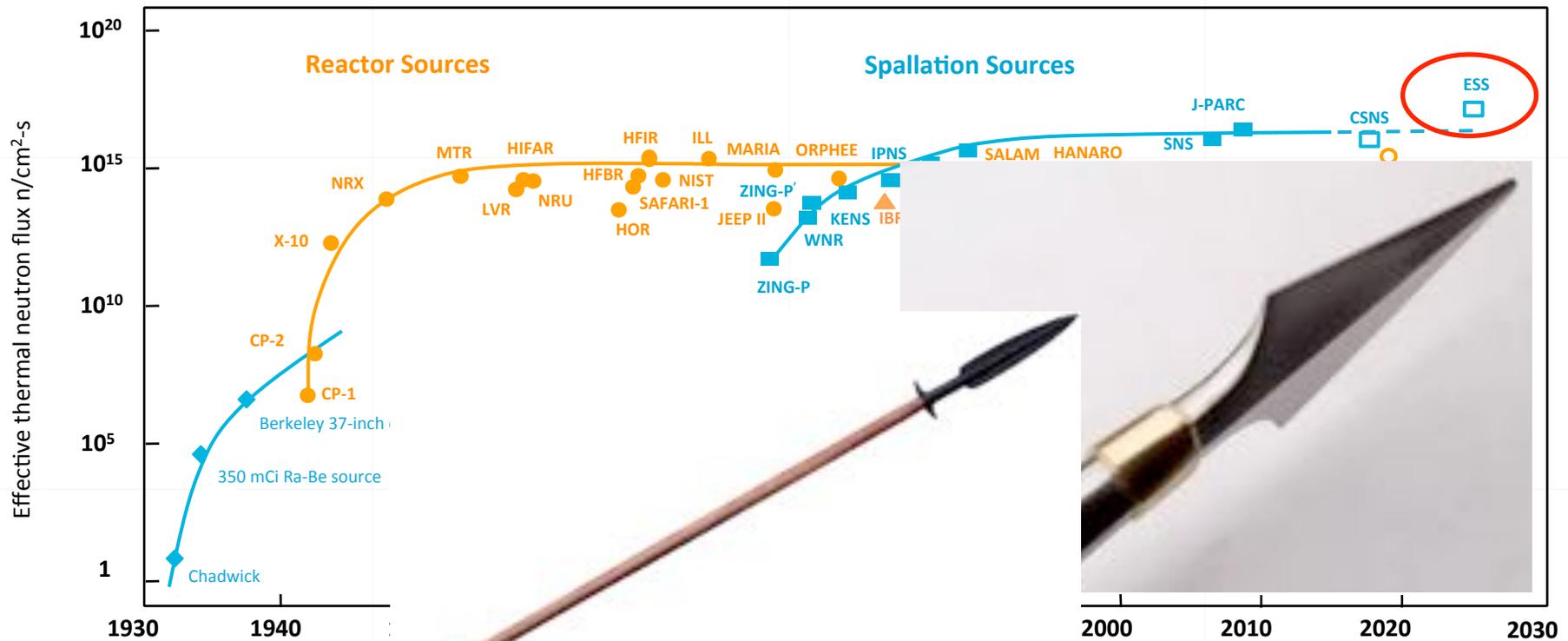
Spectroscopy

C-SPEC	
VOR	
T-REX	
BIFROST/CAMEA	
VESPA	
MIRACLES	
High-Resolution Spin-Echo	
Wide-Angle Spin-Echo	
Fundamental & Particle Physics	

	life sciences		magnetism & superconductivity
	soft condensed matter		engineering & geo-sciences
	chemistry of materials		archeology & heritage conservation
	energy research		fundamental & particle physics

# ESS - Bridging the Neutron Gap

- ESS will be more powerful and several times brighter than existing facilities
- **Complements existing neutron scattering facilities**



(Updated from *Neutron Scattering*, K. Skold and D. L. Price, eds., Academic Press, 1986)

# NSS Build Partners



# The ESS Neutron Instruments



Large-Scale Structures

ODIN 	     
SKADI	   
LOKI	 
Surface Scattering	   
FREIA 	  
ESTIA 	   
HEIMDAL 	   
DREAM	   
Monochromatic Powder Diffractometer	  
BEER 	 
Extreme Conditions Diffractometer	   
MAGIC	 
NMX	 

Diffractometer

Spectroscopy

C-SPEC	  
VOR 	   
T-REX	  
BIFROST 	   
VESPA 	  
MIRACLES 	  
High-Resolution Spin-Echo	   
Wide-Angle Spin-Echo	   
Fundamental & Particle Physics	

	life sciences		magnetism & superconductivity
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# The ESS Neutron Instruments



Expertise in neutron scattering and instrumentation



# Small neutron sources



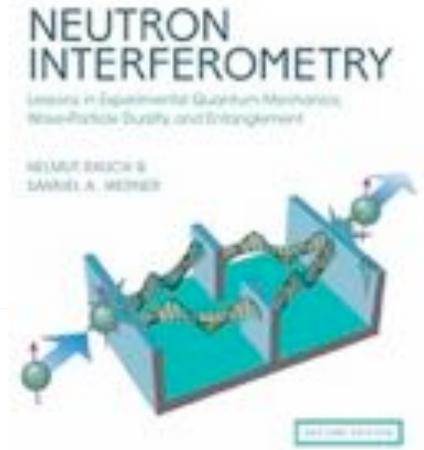
250kW TRIGA Mark-II Reactor



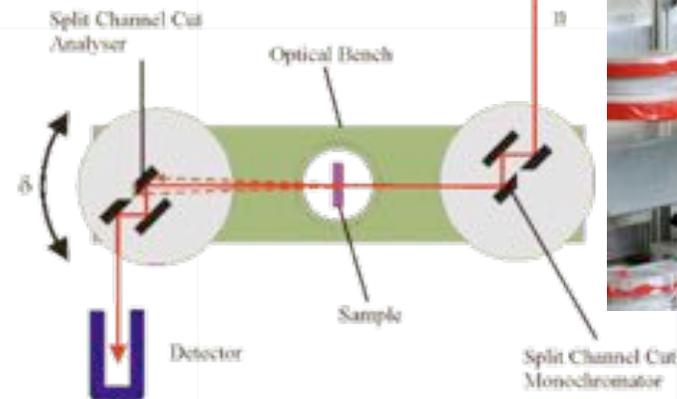
# Synergies – Education/Training



## TRIGA – Training, Research, Isotope, General Atomic



Sketch of the Bonse-Hart Camera with triple-bounce monochromator and analyser crystals



# Synergies – Developments

- Technology
- Methods
- Prototypes
- Testing
- Data
- Simulation

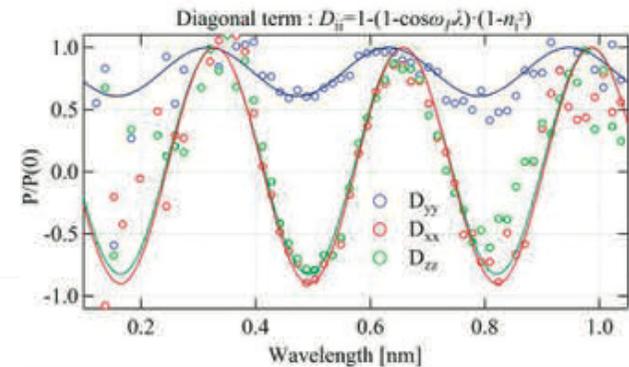
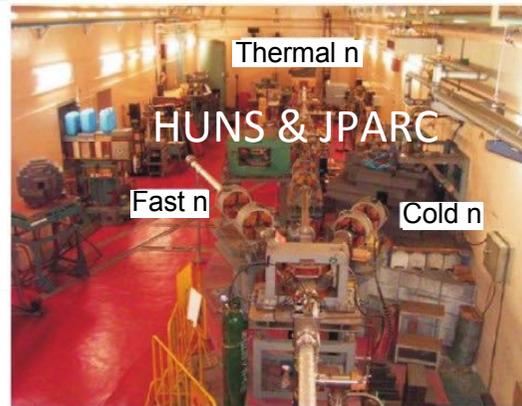
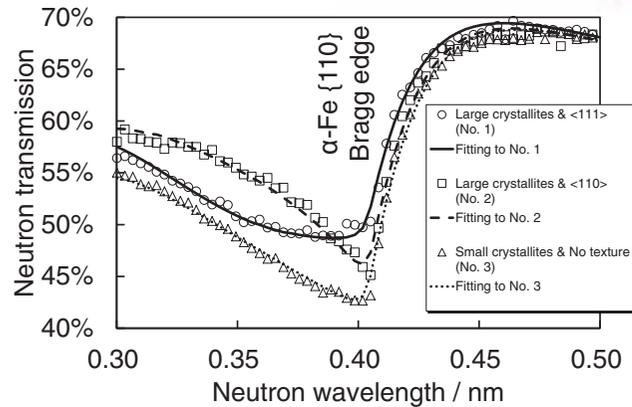
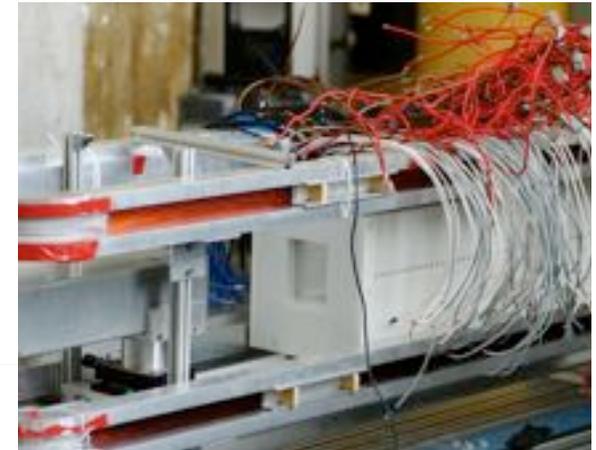
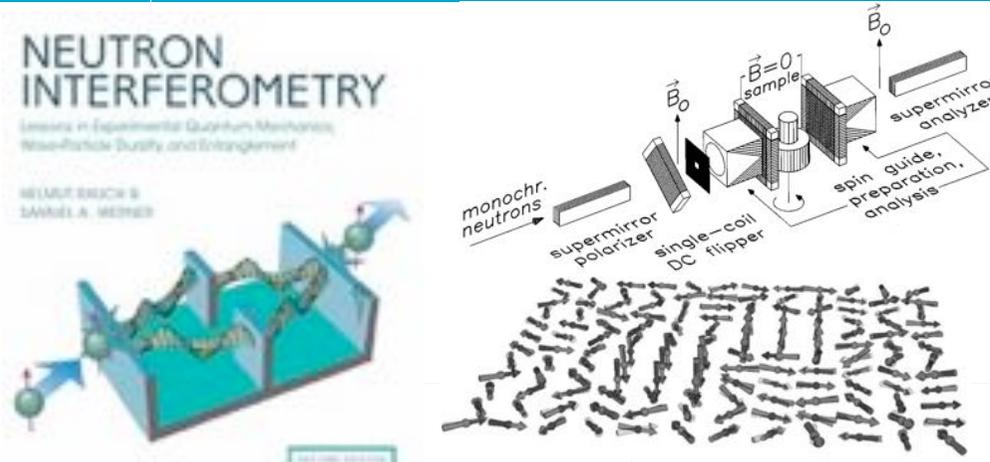
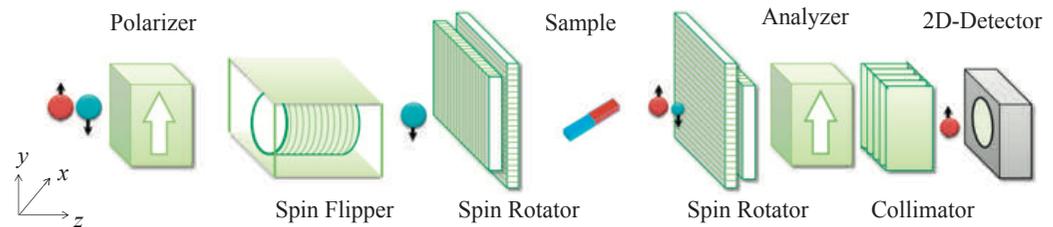


Fig. 2. Bragg-edge transmission spectra measured at HUNS, and the profile fitting curves obtained by RITS.



# Synergies – Complementary applications

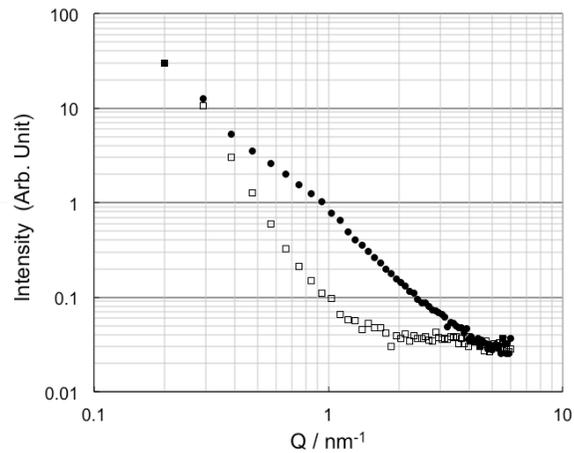
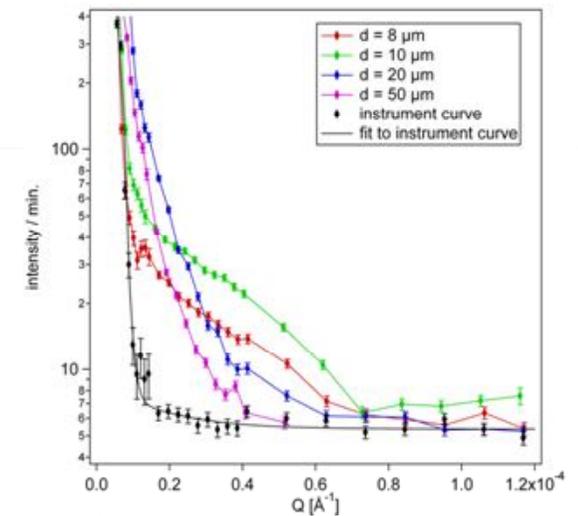
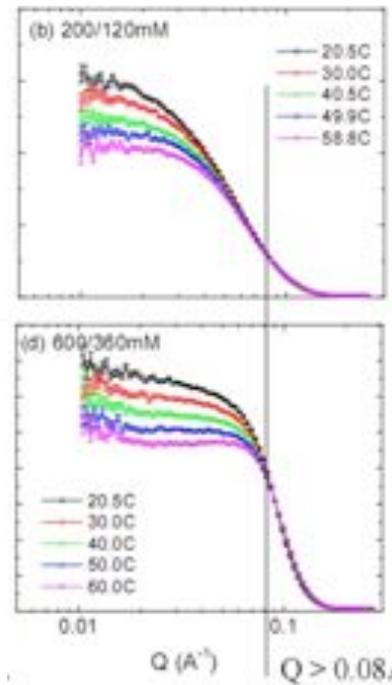


Fig. 1. SANS in steel samples with (filled markers) and without (open markers) nanoscopic precipitates.



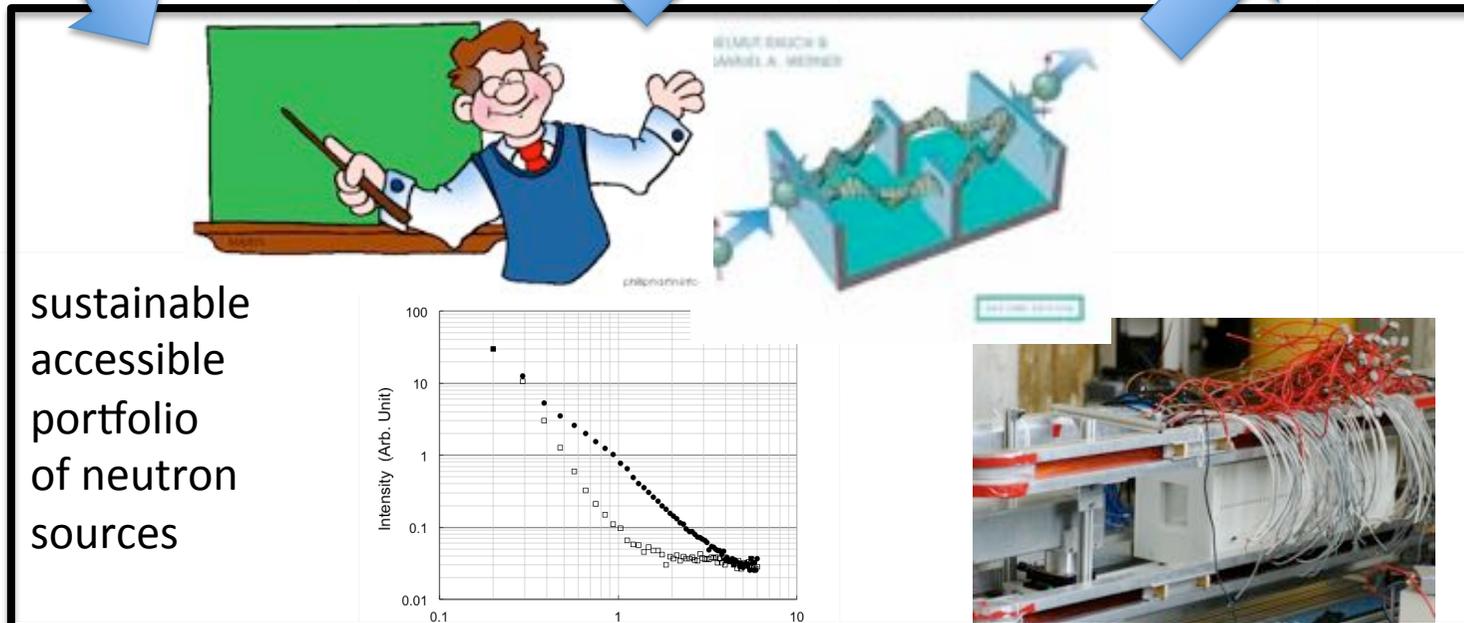
# Synergies – Expertise/User Base

## Universities

	life sciences		magnetism & superconductivity
	soft condensed matter		engineering & geo-sciences
	chemistry of materials		archeology & heritage conservation
	energy research		fundamental & particle physics



sustainable accessible portfolio of neutron sources



The composite image includes:

- A cartoon teacher pointing at a greenboard.
- A 3D diagram of a neutron scattering experiment with labels 'EMILY BRICK & JAVIERA. MENDOZA' and 'philipps.uni-kl'.
- A log-log plot of Intensity (Arb. Unit) vs. wavelength (nm) with data points and a fitted curve.
- A photograph of a neutron detector setup with red and white cables.

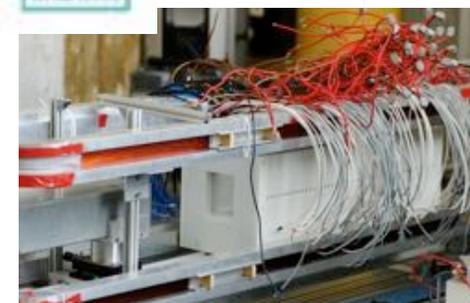
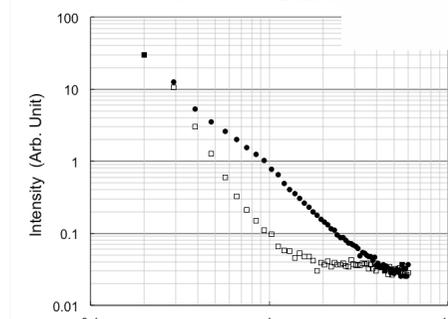
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 chemistry of materials	 archeology & heritage conservation
 energy research	 fundamental & particle physics



sustainable accessible portfolio of neutron sources



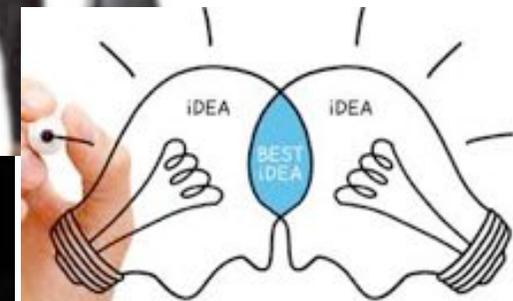
## ESS supports regional source initiatives

### Can provide:

- Advice and expertise
- Collaboration
- Political support

### Cannot provide:

- resources



# Thank you!

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**M. Strobl**

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