



# The contribution of biomedical research infrastructures to training and knowledge production in the regions

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2009

# Overview

- Biomedical research infrastructures are distributed RIs, that offer unique opportunities for regional development
- Biomedical RIs benefit from integration of their activities (added value)
- Examples for the possible organisation of BMS projects including national nodes



# European Intergovernmental Research Organisations



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# European Molecular Biology Laboratory

## Facts & Figures

- Intergovernmental organisation
- Established in 1974
- Funded by 20 Member States
- **Five sites in four countries**
- Main site: Heidelberg, Germany
- 1400 staff, >60 nationalities
- Budget: € 147 Mio (2007)

## Missions

- Basic research in molecular biology
- Advanced training (postgraduate)
- Services to member states
- Development of technology
- Technology transfer



# The EMBL model

- EMBL Council: 2 delegates from each member state, 1 scientific, 1 administrative, Council chair = scientific delegate, Finance Committee chair = administrative delegate
- Scientific Programme and Indicative Scheme (budget) approved by EMBL Council every 5 years
- No juste retour
- Research, training, service provision and technology transfer
- Stringent quality control: Scientific Advisory Committee
- **Fixed-term contracts:** high flexibility, return to member states



# The success of the EMBL model

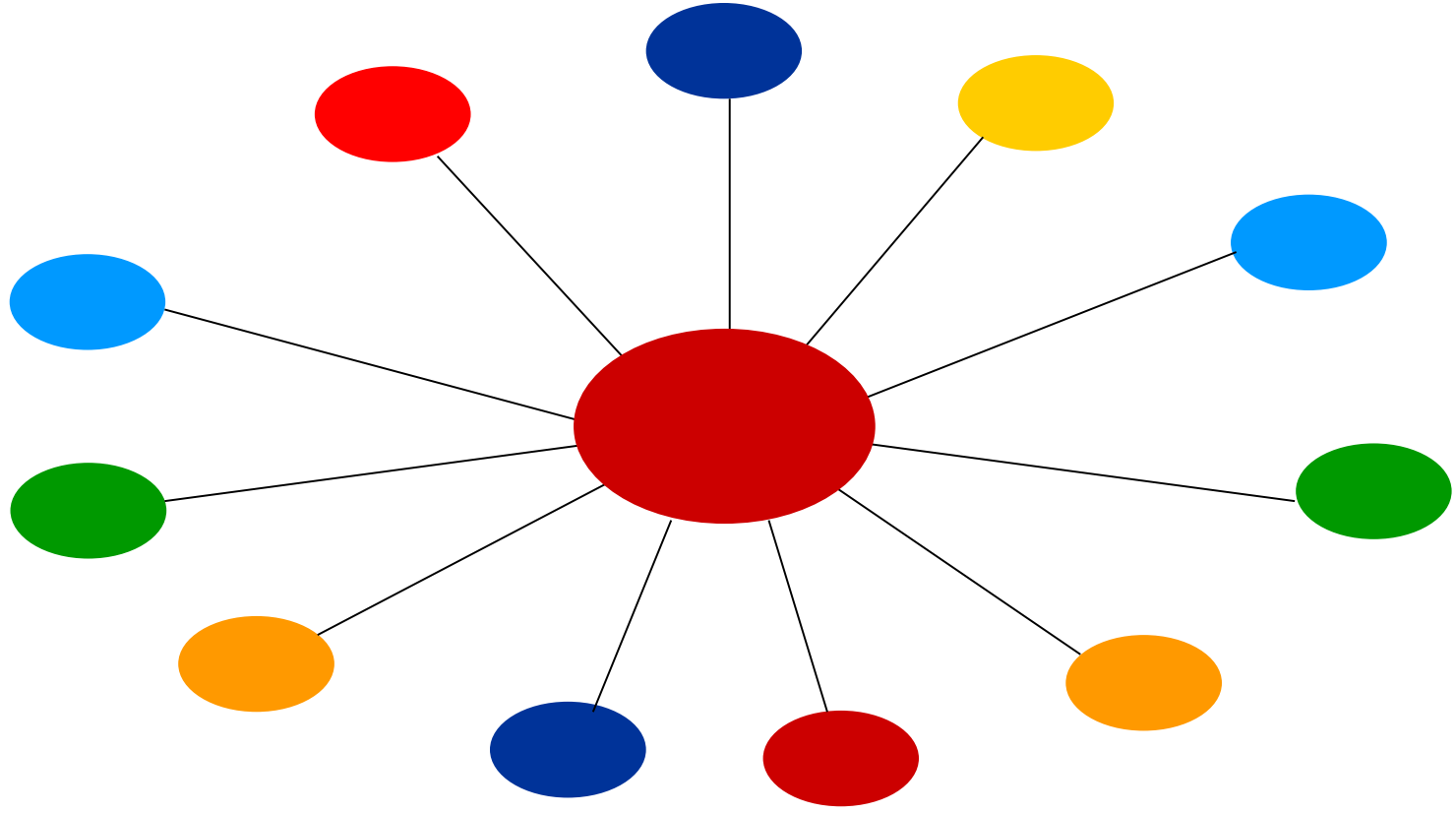
- Leading research institute in Europe in genetics and molecular biology (bibliometrics)
- European bioinformatics data resources (EBI)
- (Largest) European provider of synchrotron radiation for life science applications, collaboratively with ESRF and DESY
- To date trained more than 3000 scientists that form a unique network of EMBL Alumni
- Highly recognized and imitated Training Programmes
- 11 spin-out companies founded since 1997



# ESFRI Roadmap - Biomedical RI

- ELIXIR - Upgrade of European Bioinformatics Infrastructure
- INSTRUCT - Integrated Structural Biology Infrastructure
- INFRAFRONTIER – phenotyping and archiving of model mammalian genomes
- BBMRI - European Biobanking and Biomolecular Resources
- EURO-BIOIMAGING – Biomedical Imaging
- EMBRC – European Marine Biology Resource Centre
- ECRIN - Infrastructures for Clinical Trials and Biotherapy
- EATRIS – advanced translational research in medicine
- EU-OPENSOURCE – screening platforms for chemical biology
- European High Security BSL4 Laboratories

# Distributed Biomedical RIs



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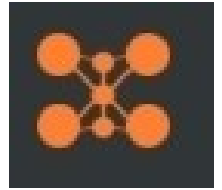


# Hub and nodes in biomedical research infrastructures

- The Hub represents a central coordination unit
- The Nodes are distributed across several countries
- Hub and Nodes do not need to belong to same legal entity
- The Hub distributes money to Nodes
- Nodes can have different functions and tasks essential for the RI
- Nodes can be of different size, and can be smaller or bigger than the Hub as appropriate
- Nodes receive national and central funding
- The Hub could be an ERIC (EU member States and associated countries, intergovernmental organisations as members)



# From the EBI to ELIXIR



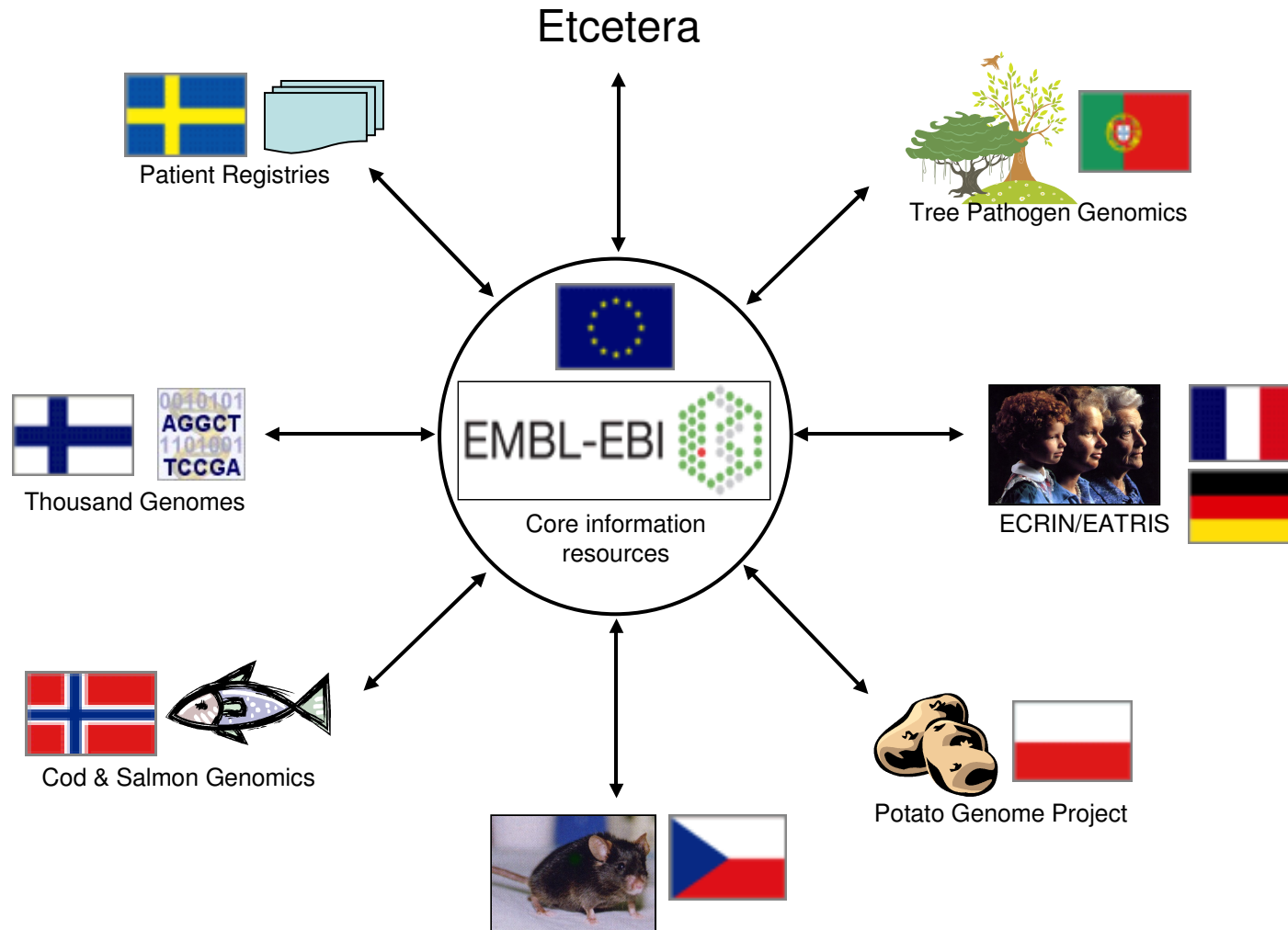
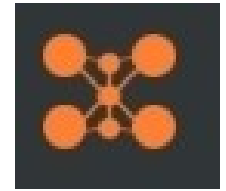
- EBI is an EMBL outstation that receives 50% of its funding from EMBL Member states and 50% from recurrent and non-recurrent funding sources
- EBI currently provides access to core biomolecular information to scientists across all of Europe and further afield (DNA, Protein, RNA)
- It also develops and provides access to bioinformatic tools
- Roughly 1 million different users annually, at least 20% from Industry
- Over 3 million web hits per day

# Dealing with a data Tsunami:Elixir

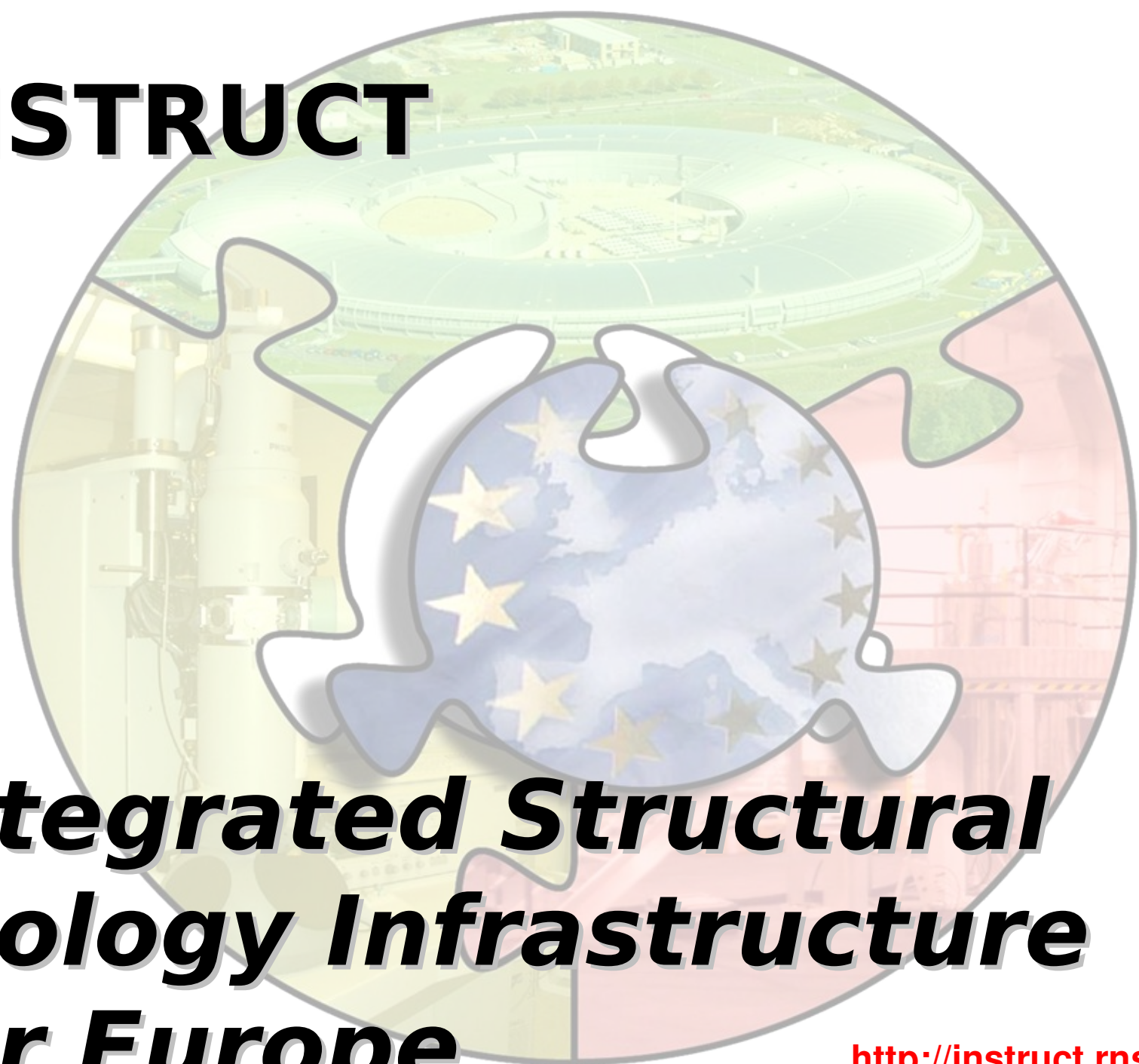


- A reliable ***distributed*** infrastructure to provide equality of access to biological information across all of Europe
- Sustainable funding for the ***core*** European biological data collections (genomes, sequences, structures etc)
- Sustainable funding for the ***global*** biological data collaborations (UniProt, ww-PDB, INSDC etc)
- Processes for
  - developing ***new*** core data collections (imaging, clinical)
  - integration*** of diverse data types
  - supporting ***interoperability*** of bioinformatics tools
  - developing bioinformatics ***standards*** and ***ontologies***
- ***Enhanced*** use of biological information in Academic Research, the Pharmaceutical Industry, Biotechnology, Agriculture and for the Protection of the Environment

# ELIXIR: Member-state infrastructure possibilities



# **INSTRUCT**



***Integrated Structural  
Biology Infrastructure  
for Europe***

<http://instruct.rns4u.com/>

# Affiliated Countries:

*By December 2008 the  
following countries will  
be INSTRUCT affiliated  
countries:*

**Czech Republic**

**Denmark**

**Finland**

**France \***

**Germany \***

**Greece**

**Hungary**

**Israel \***

**Italy \***

**Netherlands**

**Portugal**

**Slovakia**

**Slovenia**

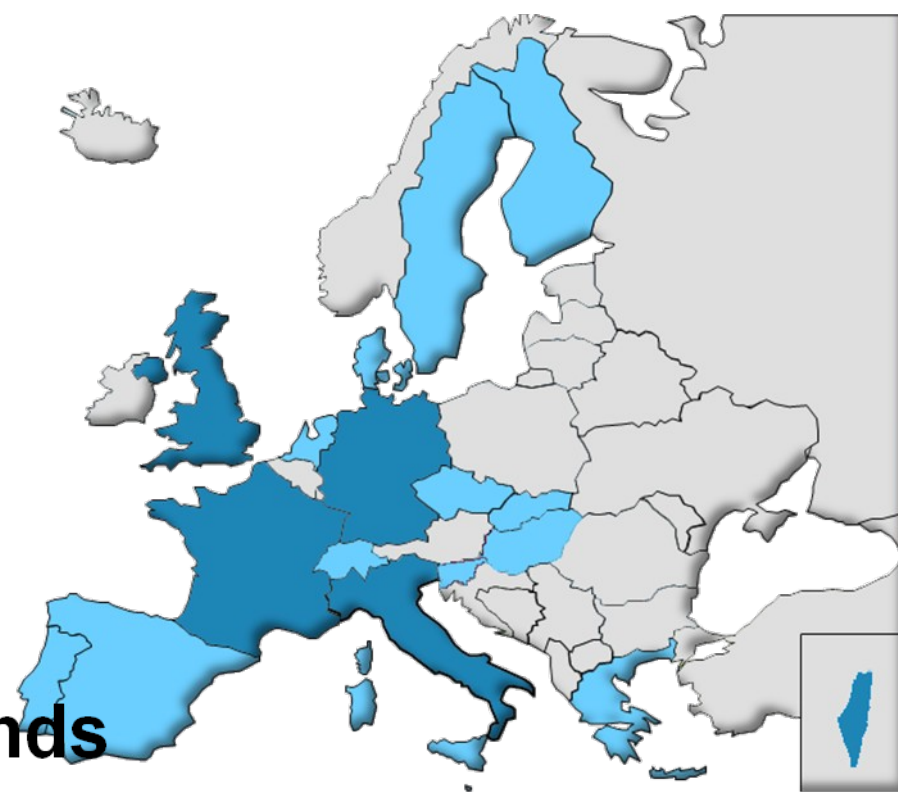
**Spain**

**Sweden**

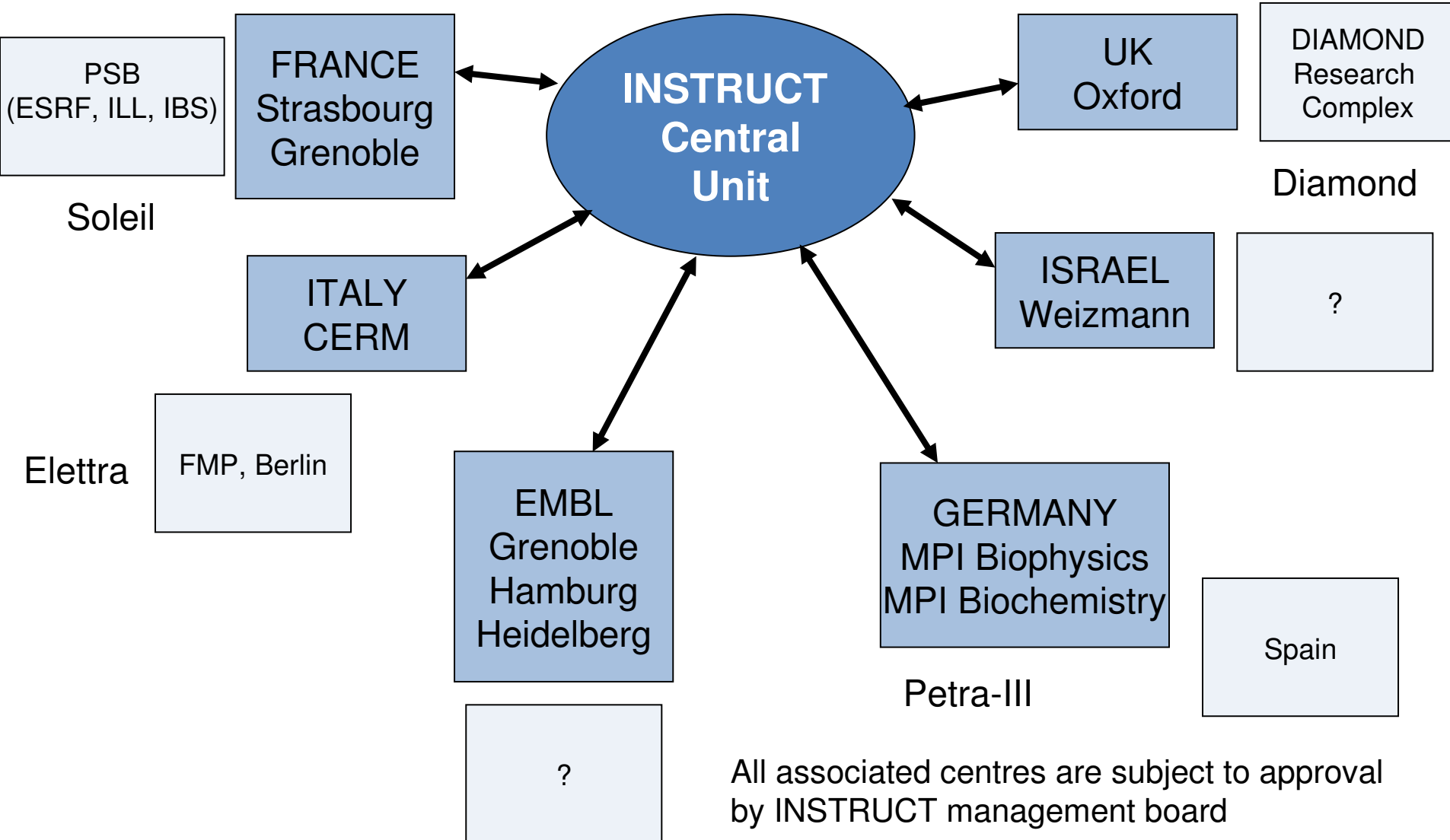
**Switzerland**

**UK \***

**EMBL \***



# Who is involved in INSTRUCT?



# INSTRUCT Central Unit

## **Tasks**

- User access administration (trans-national)
- Apply for and hold grants
- Coordinate new technology development
- Interaction with industry
- Training (of users)

## **Staff**

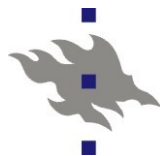
- Initially 5-10 permanent staff
- More if external funding can be raised



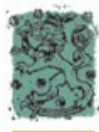
# INSTRUCT Central Unit

## **Legal entity**

- Only the central unit would need to be a new legal entity
- Core centres and associated centres could remain national research organisations
- Could be new European legal structure for research infrastructures (ERIC) or EMBL "special project"



# Institute for Molecular Medicine Finland FIMM



Orion-  
Farmos  
Research  
Foundation

# European Strategy Forum on Research Infrastructures (ESFRI): Opportunities arising from synergies



- FIMM (Institute for Molecular Medicine Finland, EMBL Molecular Medicine partnership) is involved in three of the six infrastructure planning projects in the field of life sciences
- EATRIS: European Advanced Translational Research Infrastructure in Medicine (FIMM / Ministry of Education)
- BBMRI: Biobanking and Biomolecular Resources Research Infrastructures (FIMM/THL)
- ELIXIR: European Life-science Infrastructure for Biological Information (together with CSC, the Finnish IT Center for Science)

All these three ESFRI infrastructure planning projects have been approved to the national roadmap for infrastructure development

# European Strategy Forum on Research Infrastructures (ESFRI): Opportunities arising from synergies between life-science infrastructures



ELIXIR: Life-science Infrastructure for Biological Information (EBI-EMBL coordinating: bioinfo collaboration)



BBMRI: Biobanking and Biomolecular Resources Infrastructures (biobanking and biomarker applications)



EATRIS: Translational research (e.g. drug discovery, development and diagnostics)



Suggested national focus: ESFRI-centre/network that leverages existing infrastructures, creates new ones and facilitates multi-disciplinary research opportunities from links between ESFRI projects

For example: New capabilities in personalized medicine by combining medical bioinformatics, biobanks and translational research infrastructures



# BIOCEV



## **Biotech & Biomed Research Center of Academy of Sciences and Charles University**

Vestec at Prague

**Regional development and competitiveness  
through promotion of cutting-edge biotechnology and  
biomedical R&D in Czech Republic**

**Selected for the Indicative list of major projects of the  
Operational Program R&D for Innovation  
European Regional Development Fund**

**2007 - 2013**

**BIOCEV v.v.i.**  
**National Biotech&Biomed Research Infrastructure**

**GRADUATE  
EDUCATION**

**International School of advanced studies in biotechnology and  
biomedicine**

**MOUSE CLINIC**

**INFRAFRONTIER**

National mammalian model  
phenotyping, genome mining  
& archiving infrastructure

**STRUCTURAL**

**BIOLOGY**

**INSTRUCT**

National Structural Biology  
Infrastructure  
&  
OMICS  
Infrastructure

**BASIC RESEARCH**

Molecular  
Genetics & Cell Biology  
&  
Immunology & Tumor Biology  
&  
Eukaryotic Microbiology

Protein and Cell  
&  
Biomaterials and Tissue  
Engineering  
&  
Methods development

**ORIENTED RESEARCH**

Protection of  
Intellectual property  
Technology transfer  
& Business development

**IMAGING**

**Euro-  
BioImaging**

National  
Biological Imaging Core  
facility

**CELL CULTURE**

National Protein  
Expression  
and Purification facility  
&  
Cryotechnologies  
&  
Biobanking  
facility



# BIOCEV v.v.i. National Biotech&Biomed Research Infrastructure

**The**

**linked to ESFRI – INFRAFRONTIERS**

Czech Mouse Clinic - Center of knock-in/knock-out mouse phenotyping

**linked to ESFRI – Euro-BioImaging**

**linked to ESFRI – INSTRUCT**

Compact light source with laser undulator

(3 beam lines of 35 keV X-rays for protein crystallography)

700 MHz NMR with cryoprobe for protein structure determination

## **Additional open-access equipment of BIOCEV**

- top-level optical and electron imaging
- Cutting-edge mass spectrometry for top-down protein modification analysis (FT-MS ion cyclotron 15T)
- Animal transgenesis unit
- mammalian cell culture facility
- Recombinant protein purification facility
- IT and data storage
- Biobank and cryo repository

# What is needed for the regions to have maximum benefit from RI?

- mechanism to use structural funds to build infrastructure and capacity
- training of qualified staff in other facilities in Europe
- transfer of know-how from other facilities
- full integration into distributed European research infrastructures
- provision of trans-national access



