The future of Science and Technology in Europe

Lisbon, 8-10 October, 2007

European Intergovernmental Research Organizations: role, importance, and perspectives for science and technology in Europe

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Instruments for S&T cooperation at European level

In March 2000, the Lisbon Summit fixed the objective that Europe should become the most competitive and dynamic knowledge-based economy in the world.

On the way towards achieving this ambitious objective, Europe needs better coordination between the RTD programmes and initiatives, carried out at national and at European level; that is one of the issues identified in the ERA Green Paper.

At present, the major instruments for pan-European cooperation in Science & Technology, co-funded by the EU and other European states, are implemented via:

- **The 7th Research Framework Programme (FP7)**
- **The Competitiveness and Innovation Programme (CIP)**
- **The European Technology Platforms and Joint Technology Initiatives, and the EUREKA framework**
- **The European inter-governmental research organizations (EIROs)**

Differences between EIROs and the EU programmes

With annual R&D budgets of around 1.5 B€, the EIROs members of the EIROforum (www.eiroforum.org) represent a key pillar of the S&T basis of Europe.

There are two major differences between the EIROs and the EU RTD programmes (FP7, CIP):

- **The EIROs have well coordinated long-term scientific programmes, focused in one discipline, whereas the EU programmes offer support to a large number of short-term projects in a variety of S&T fields.**
- **The EIROs are funded by a sub-set of European countries (member states), whereas the EU programmes are funded with contributions from all EU member states and other countries, associated to the Framework Programmes.**

The EIROs members of the EIROforum 1/8

Led by the need for (re)establishing European leadership in science, in the 1950s – 1970s a number of European countries decided to pool resources that very few of them alone (or none) could afford to collect, and with a long-term vision for the future created several European Inter-governmental Research Organizations.

The EIROs have different conventions, legal status, and memberships. Most of their member states are also members of the EU. Some of them are governed by international law (CERN, ESA, ESO and EMBL), others by national law (ESRF and ILL).

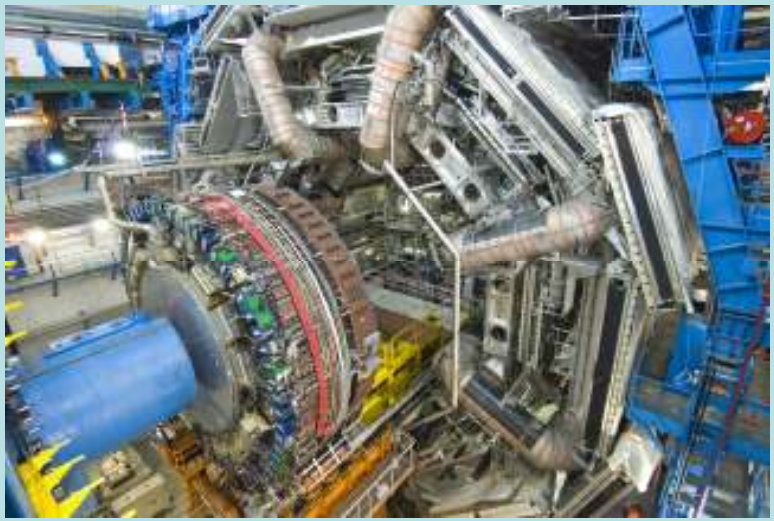
All EIROs are established by means of intergovernmental agreements.

With the strong support of their member states, the EIROs have progressed and become world-leaders in their respective fields of science.

The EIROs members of the EIROforum 2/8

CERN – European Organization for Nuclear Research

- The largest center for particle physics in the world
- Where the World Wide Web was born
- A user community of 8,000 physicists from 80 nations



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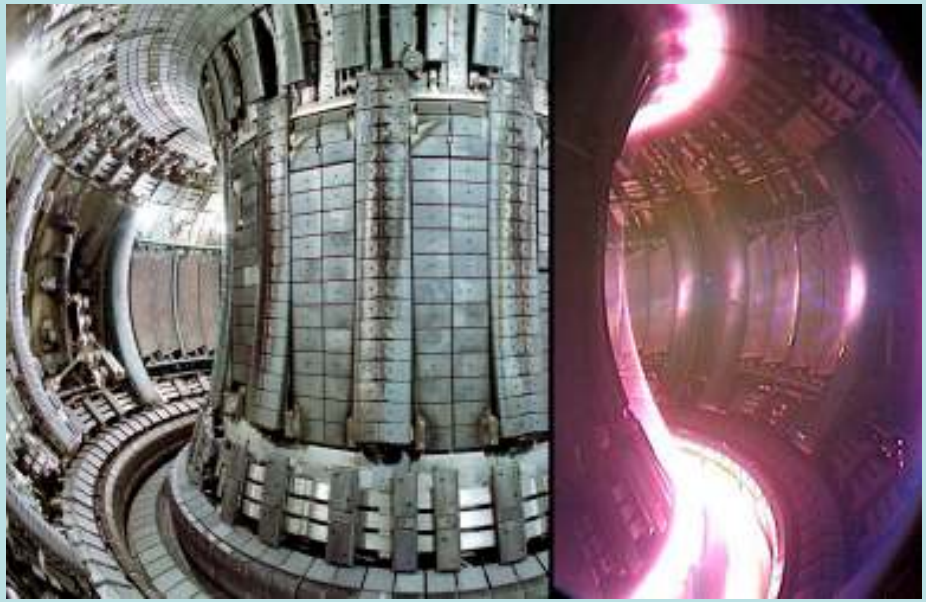
EFDA – European Fusion Development Agreement

EFDA
EUROPEAN FUSION DEVELOPMENT AGREEMENT



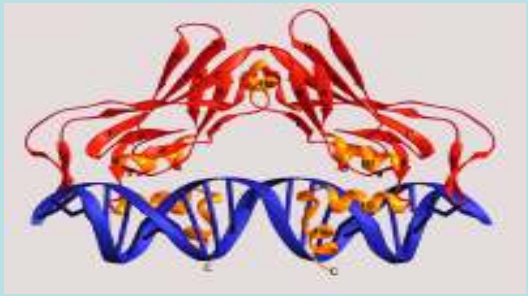
- Coordinates fusion research in Europe
- Operates JET, the largest fusion research facility in the world

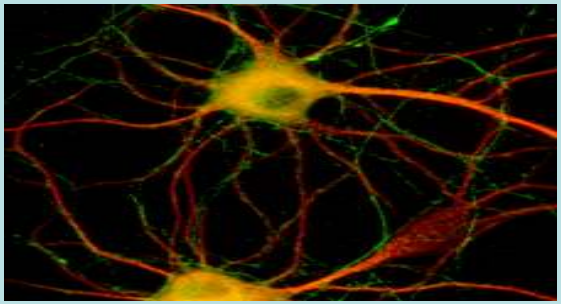
The EIROs members of the EIROforum 4/8

EMBL – European Molecular Biology Laboratory

EMBL

- Leading research institute in Europe in genetics and molecular biology
- European hub for bioinformatics data resources
- Development of new instruments and methods for the life sciences
- Active technology transfer programme

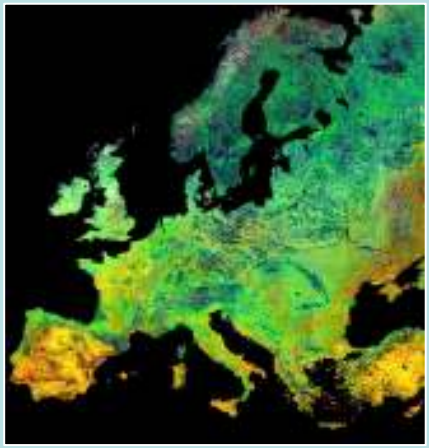


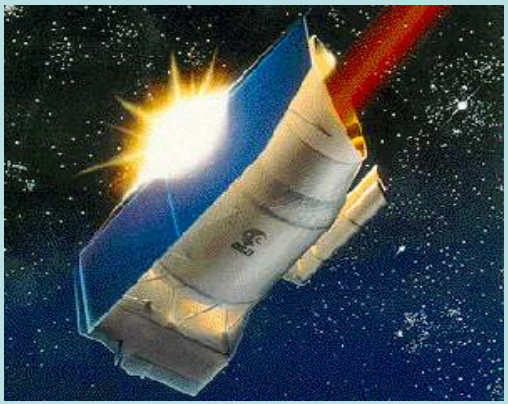


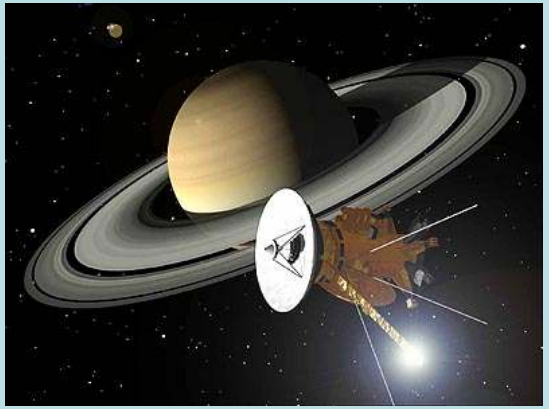
The EIROs members of the EIROforum 5/8

ESA – European Space Agency

- Human space flights
- Earth observation
- Telecommunications
- Satellite navigation
- Launcher development
- Close cooperation with the Space industry







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ESO – European Organisation for Astronomical Research in the Southern Hemisphere

- The world's most advanced ground-based astronomical facilities
- Develops cutting-edge telescope instrumentation
- Several hundred observing sessions each year

The EIROs members of the EIROforum 7/8

ESRF – European Synchrotron Radiation Facility

- A world-leading facility for research with intense X-ray beams
- 6,000 user visits and 1,500 experimental sessions per year
- Applications: biology, chemistry, materials, medicine, physics

The EIROs members of the EIROforum 8/8

ILL – Institut Laue-Langevin

NEUTRONS FOR SCIENCE

- The world's most intense reactor source of neutrons
- 1,500 user visits, 750 experiments per year
- Application fields: physics, materials, chemistry, life sciences

Reasons for the success of the EIROs 1/2

Why have the EIROs been success stories for Europe?

- **they have long-term stability and strong support from their member states, based on the commitments established via intergovernmental agreements**
- **they have well developed organizational and management models, that have proven their efficiency**
- **they have managed to become world-class centers of excellence**

Reasons for the success of the EIROs 2/2

Why have the EIROs been success stories for Europe?

- **they attract the best scientists and researchers from, and beyond their member states**
- **their scientific programmes, defined according to the needs of the scientific communities, have structured the European research in the corresponding fields**
- **they connect Europe, via their scientific cooperation programmes, to the rest of the world**

Areas of success of the EIROs 1/5

Apart from scientific research (their main mission), the EIROs have been highly successful in other areas, such as:

Technological development

- **The successful implementation of the European Fusion Programme (EFDA) has paved the way for ITER, a 4.5 B€ project for demonstrating the feasibility of thermo-nuclear fusion as future energy source.**
- **The Large Hadron Collider (LHC), due to switch on in 2008 will be the most powerful particle accelerator in the world. During the 15 years of design, construction and commissioning of the 4 B€ LHC project, a number of edge-cutting technologies have been developed in the following fields:**
  - **civil and mechanical engineering**
  - **electrical engineering and electronics**
  - **controls, data acquisition systems, and particle detectors**
  - **magnets, superconductors, and cryogenics**
  - **grid computing, data storage and processing**

Areas of success of the EIROs 2/5

New electronic infrastructures

- The nature of research in certain fields has changed with the increasing reliance on digital techniques and the emergence of Virtual Organizations that allow researchers across Europe and beyond to collaborate by sharing information, applications and data.
- These Virtual Organizations are only possible because of advances in Information and Communication Technology (ICT) notably in the areas of Networking, High Performance Computing and Grids. These electronic European infrastructures become essential for the exploitation and access to existing and new Research Infrastructures.
- Such electronic infrastructures result in more efficient and dynamic usage of ICT resources, in reducing the digital divide between the regions of the world, and enabling cross-discipline teams to address research challenges on a scale previously beyond their reach.

Areas of success of the EIROs

Innovation and Technology Transfer

- **The Technology Transfer Programme Office of ESA has successfully transferred over 200 space technologies to non-space sectors, such as Automotive, Medical, Energy, Textile, Security and Robotics. 20 start-up companies were created in 2006.**
- **EMBLEM, a subsidiary company of EMBL, transfers innovative technologies from basic research to industry for the development of new medical diagnostics, drugs, therapies, and machines and devices for Life Sciences. EMBLEM currently manages a portfolio of more than 170 patents and over 200 license contracts. 10 spin-off companies have been founded since 1997.**

Areas of success of the EIROs 4/5

Education and training

At CERN (for example) there are various training and education programmes:

- **for technical students (undergraduate level): 80 enrolled per annum**
- **summer school (undergraduate level): 160 attendees per annum**
- **for doctoral students (M.Sc. level): 90 enrolled per annum**
- **Fellowship programme (PhD level): 120 Fellows per annum**
- **for visiting senior scientists**
- **for secondary school teachers: attended by 800 teachers in 2007.**

Areas of success of the EIROs 5/5

International cooperation

All EIROs are involved in extensive European and often global cooperation programmes.

- **CERN has co-operation agreements with governments of more than 40 non-member states .**
- **More than 80 countries from all over the globe are involved in the LHC project.**
- **ITER – a global project with the participation of the EU, Japan, China, India, Korea, Russia, and the USA.**

New EIROs needed?! 1/2

All EIROs have long-term scientific programmes and will continue to play a key role for science & technology in Europe, and in the further development of the European Research Area.

Despite the widely recognized fact that the EIROs have been very successful, in the last 2 decades there were no new EIROs created. The last European intergovernmental research organization was created in 1988 (ESRF).

An obvious question is why the European countries have refrained from creating new EIROs in the last 20 years, a period when the European Union acquired an increasingly active role in S&T policy ?!

New EIROs needed?! 2/2

Nowadays science and technology are developing at a fast pace on a global scale. Besides the economic powers, such as USA and Japan, Europe is facing serious competition by other countries that invest heavily in R&D – China, India, Korea.

In order to remain competitive and/or to maintain Europe's leadership in certain S&T fields, there is a strong need at this moment to create new European centers of excellence.

This need has driven the creation of the first European Roadmap for Research Infrastructures, published in October 2006 by ESFRI, containing 35 projects in different (but not all) fields of science; developed by science and policy stakeholders from the EU Member States and Associated States.

New research infrastructures of European interest

A few open questions:

- **How will the ESFRI Roadmap projects be realized and funded, knowing that some 14 B€ are necessary for the successful implementation of all 35 projects?**
- **What will be the legal status and the organizational model of the new research infrastructures of European interest?**
- **How will each European country decide which projects to fund and which organizations to join?**
- **What will be the role of the European Community in the implementation phase of these projects?**

Concluding remarks 1/2

- **Excellence should be the key feature of science & technology in Europe. In the pursuit of excellence, the EIROs may serve as good examples in different areas.**
- **Intergovernmental collaboration mechanisms based on intergovernmental agreements are most suitable for the creation of new research infrastructures and centers of excellence of European interest.**
- **The European intergovernmental organizations currently present the most efficient model for constructing and operating major research facilities in Europe.**
- **The European countries should endeavor, using the principle of variable geometry, to combine their resources and complement the existing EIROs with new research facilities in other fields of science, stemming from the ESFRI process.**

Concluding remarks

- **The EIROs are willing to offer their expertise and experience to the EU and other European states for the organization of new European research infrastructures and centers of excellence.**
- ***"Good is Enemy of Great",* best-selling author Jim Collins said in one of his books about business excellence. Europe has (far too) many *good* universities, research institutes, and industrial companies. What Europe needs, is to have more *great* universities, research centers, SMEs and large companies.**
- **The achievement of excellence will require concerted and sustained efforts by all S&T stakeholders. If we all keep this in mind, we can look forward confidently to the future of Europe's science and technology.**

THANK YOU FOR YOUR ATTENTION!