

S&T Landscape in a Changing World

Enhancing US Collaboration with EU and its Member States

Challenges of Transatlantic R&D Collaboration

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Outline of Presentation

- 1) General rationale and main challenges of transatlantic R&D collaboration
- 2) Concrete examples of R&D collaborations across the Atlantic:
The case of Portugal International Partnerships (since 2006)
with MIT, Carnegie Mellon, UT Austin, Harvard Medical School, and the
collaboration MIT-INL (International Iberian Nanotechnology Laboratory)



Enhancing US Collaboration with EU and its MS

Main Reasons to Strengthen US-EU Cooperation in S&T

- **International Knowledge Networks** are of foremost importance in a globalizing world of knowledge-based economies.
Knowledge is a very peculiar resource: contrary to material resources, when you share your knowledge with others you do not lose a little bit of it and you end up adding an extra amount to your own pre-existing knowledge.
- Exploring **complementarities of scientific facilities, specific thematic or disciplinary strengths and talent pools** expands opportunities of groundbreaking research
- Collaborative work involving **institutional, organizational and cultural diversity** is particularly productive and rewarding
- Pooling together S&T resources allows **addressing grand challenges** that may be difficult to tackle alone



Enhancing US Collaboration with EU and its MS

Ultimate Goals Must be Centred on **RESEARCHERS**

→ Scientific cooperation is built on strong relationships of **TRUST** and **CONFIDENCE** for high quality **collaborative work**, and stands on the adoption of appropriate processes for their **sustainability**.

TRUST and **CONFIDENCE** ultimately depend on **PERSONAL** relationships between researchers, and on sustainable **Knowledge Networks** involving research institutions, universities and enterprises.

→ The **best possible framework** must be established for **BOTTOM UP** **collaborations to flourish** and to **produce excellent research** contributions to **SCIENCE, SOCIETY** and **ECONOMY**



Main Challenges of US-EU R&D Collaboration

- How to foster **sustainable and strengthened collaborations** between **researchers** for building up evolving **Knowledge Networks** and opening them to **relationships with industry and business**?
- Which policy instruments **centred on researchers** can facilitate **bringing together complementary resources** across the Atlantic around challenging common research goals?
- How to enhance **institutional collaborations** involving **researchers** of universities, research organizations and enterprises?
- How to **identify and select grand challenges** for R&D collaboration between **researchers** across the Atlantic?



Developing Frameworks for Effective R&D Collaboration across the Atlantic

Building International Knowledge Networks

The case of Portugal International Partnerships (initiated in 2006)

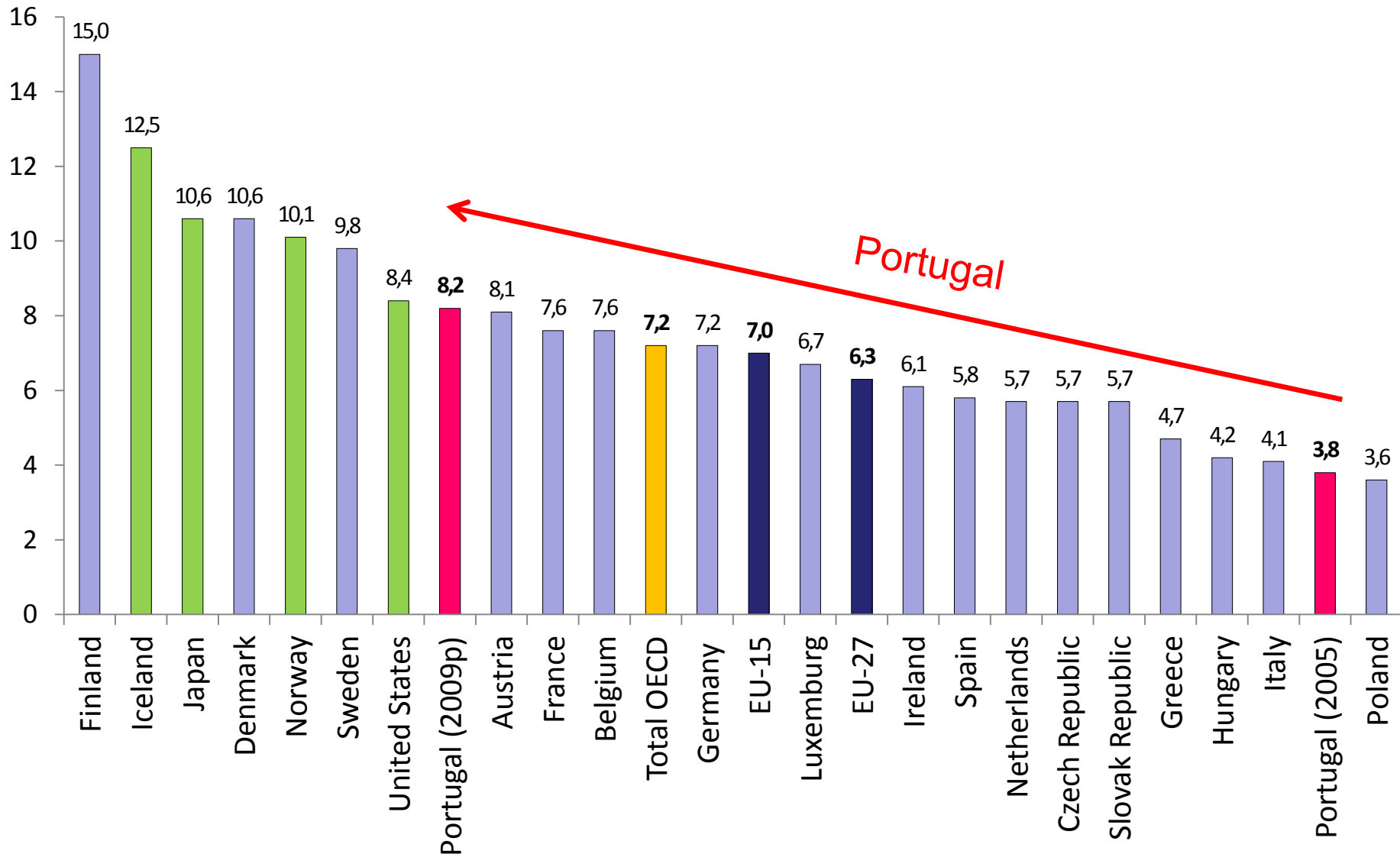


Context of High S&T Growth in Portugal more than doubling in 2005-2009

Brought a special need of international collaboration of excellence
to ensure that high growth goes with increased quality



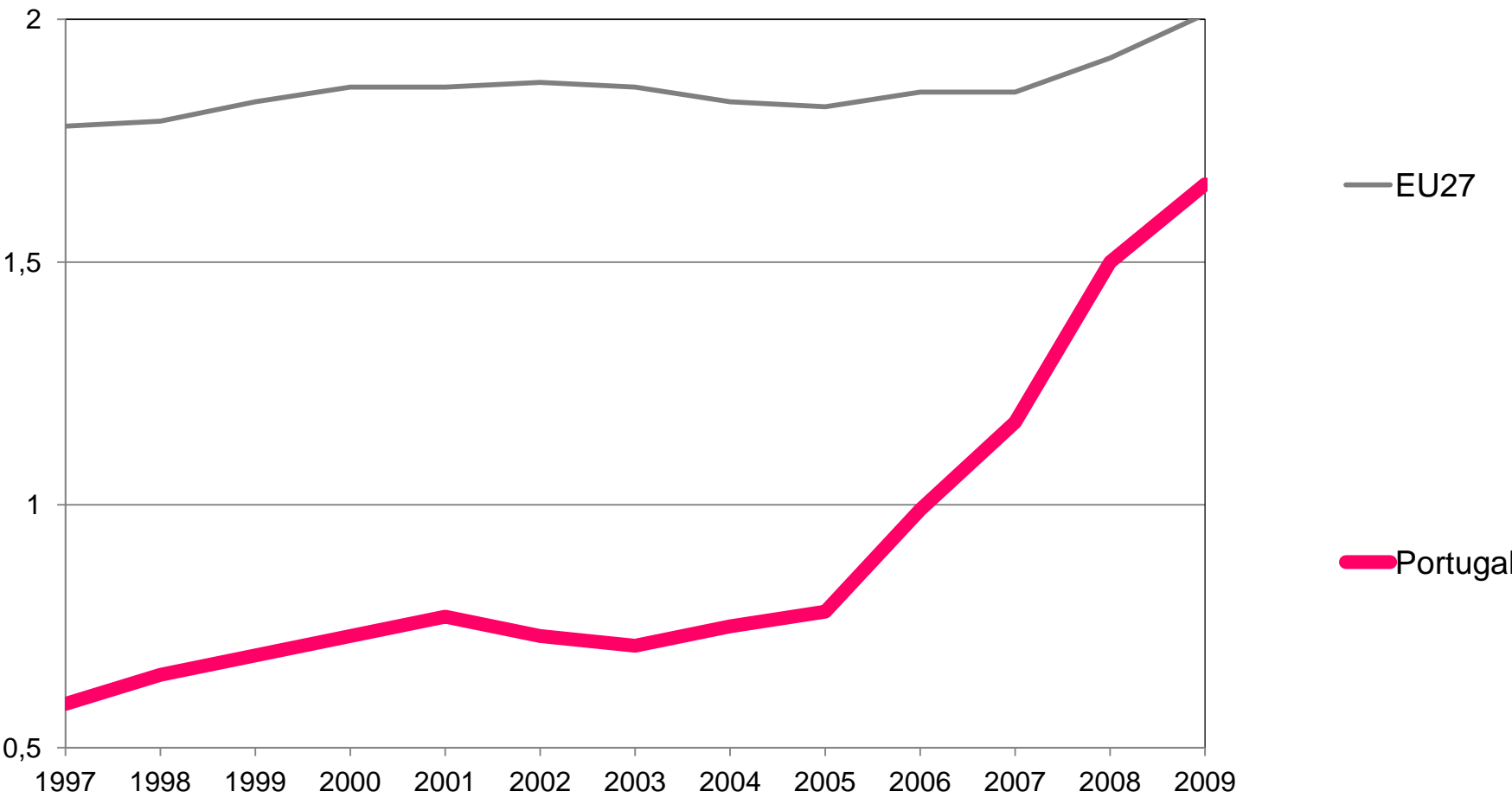
High Growth of Researchers (% labor force)



Note: Data for 2008, except for Portugal whose data are for 2005 and 2009

Source: OECD.

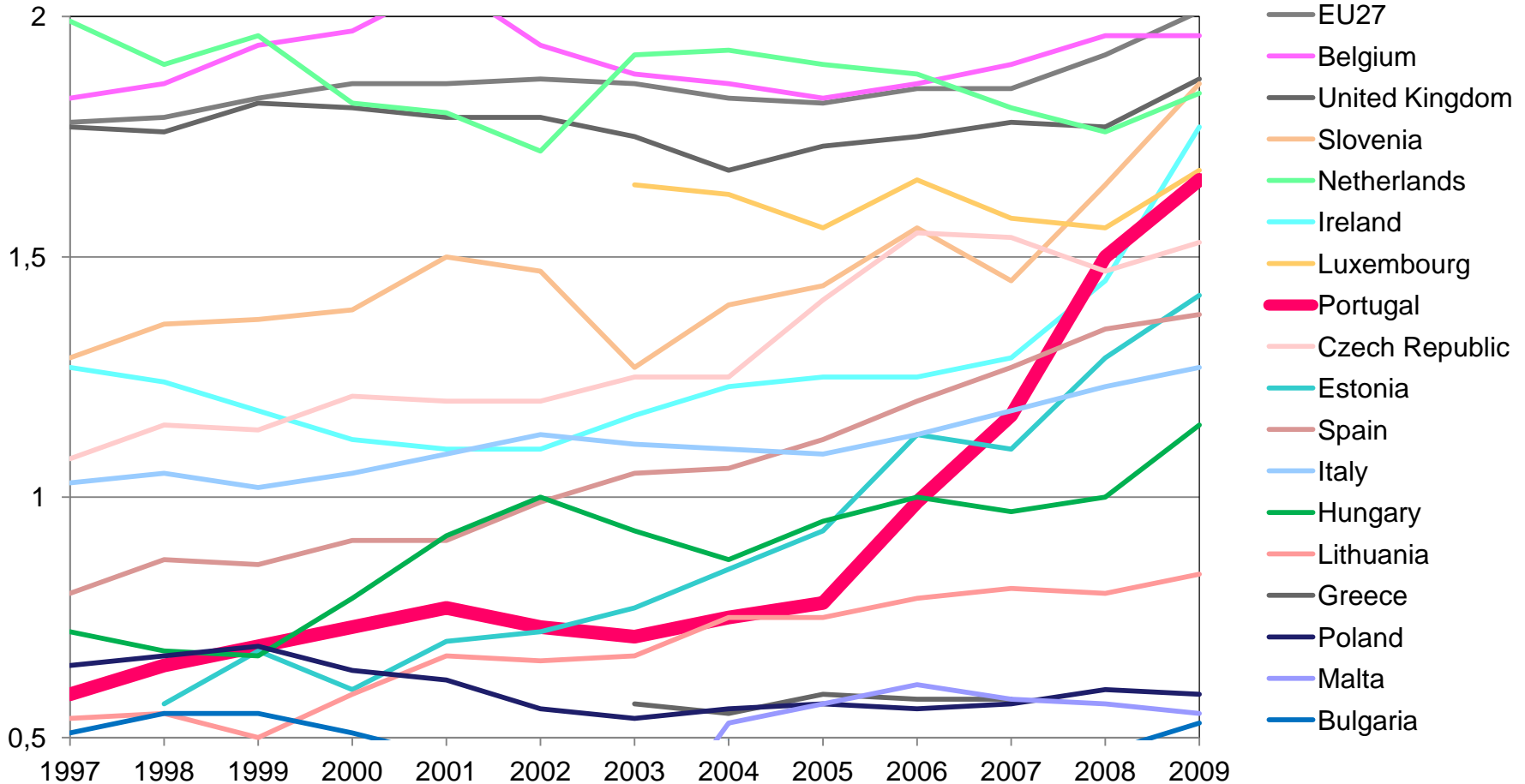
High Growth of R&D Intensity (% R&D expense on GDP)



Source: EUROSTAT

High Growth in R&D Intensity (% R&D expense on GDP)

Highest average growth (21%) of UE27 (2.5%) in 2005-2009



The case of Portugal International Partnerships (initiated in 2006)
MIT, Carnegie Mellon, UT Austin,
Harvard Medical School

The cooperation

MIT-INL

(INL – International Iberian Nanotechnology Laboratory)



International Partnerships with US Universities

Building Ambitious International Knowledge Networks

involving research, industry and university

MIT – Portugal Program (beginning 11 Oct 2006)

Engineering Systems: Sustainable energy and transportation systems • Advanced engineering design and manufacturing in electric car and mobile medical applications

Carnegie Mellon – Portugal Program (beginning 27 Oct 2006)

Future Internet Technologies: Next Generation Networks and trusted high-quality services • Critical infrastructures security and trust • Cyber-physical systems for ambient intelligence • Human-centric computing • Software engineering for large-scale dependable systems. **Mathematics. Public Policy & Entrepreneurship Dynamics**

UTexas Austin – Portugal Program (beginning 2 Mar 2007)

Interactive Digital Content, High Performance Computing, Mathematics

Harvard Medical School – Portugal Program (beginning 21 May 2009)

Medical School Students and Healthcare Practitioners, Clinical and translational research, Medical Internet Content for Citizens

International Partnerships with US Universities

Building Ambitious International Knowledge Networks

involving research, industry and university

GENERAL GOALS AND INSTRUMENTS

Creation of broad and effective **Knowledge Networks**

aimed at **advancing S&T and PhD education** in Portugal to **international competitive levels**,

bringing together a large number of Portuguese **research institutions** and **private companies**,

through **collaborative advanced research projects** approved in **open calls** and necessarily involving at least teams of 2 university/research institutions and 1 company in Portugal, and 1 team in Carnegie Mellon,

and **dual and joint PhD Programs** of Portuguese universities with Carnegie Mellon,

with **sustainable efforts** to stimulate **new knowledge**

and to exploit **new ideas for markets worldwide**.



International Partnerships with US Universities

RESULTS

Carnegie Mellon – Portugal Program

- ❖ 9 Portuguese Universities involved
- ❖ 11 departments and 5 Colleges at Carnegie Mellon involved
- ❖ about 150 professors and researchers at Carnegie Mellon
- ❖ over 150 faculty or senior researchers in Portugal, 28 of them stayed at Carnegie Mellon at least 1 term
- ❖ 56 new researchers hired by Portuguese institutions
- ❖ 7 Dual PhD Programs (students obtain a degree from both a Portuguese University and Carnegie Mellon)
- ❖ 4 Post-Docs
- ❖ 95 PhD students, >50% attracted from outside Portugal
- ❖ 30 competitive research projects approved in open calls focused on emerging research challenges
- ❖ more than 270 papers in international journals and conferences
- ❖ about 80 private companies from Portugal associated with the Program
- ❖ 4 spin-off companies resulting from the Program (FeedZai, GeoLink, Dognaedis, Mambu)
- ❖ new institutions created due to the Program:
 - Madeira–Interactive Technologies Institute (M-ITI), at University of Madeira
 - Software Engineering Institute, at University of Coimbra
 - PT-Security Lab, at the company Portugal Telecom (PT)
 - 4 Research and Technology Thematic Networks of national scope: Future Internet Services and Technologies (NET-FIT), Security and Critical Infrastructure Protection (NET-SCIP), Services and Technologies for Interactive Media (NET-STIM), Software Engineering (NET-SE)

and similarly for the other 3 programs

INL – International Iberian Nanotechnology Laboratory, at Braga, Portugal



INL – International Iberian Nanotechnology Laboratory, at Braga, Portugal

International research organization established by Treaty between Portugal and Spain (2007) and open to membership of other countries (1st in Iberian Peninsula in any area, 1st in World specifically in Nanotechnology).

Decided jointly by Portugal and Spain Nov 2005.

Building inaugurated Jul 2009. Research initiated in new facilities Oct 2010.

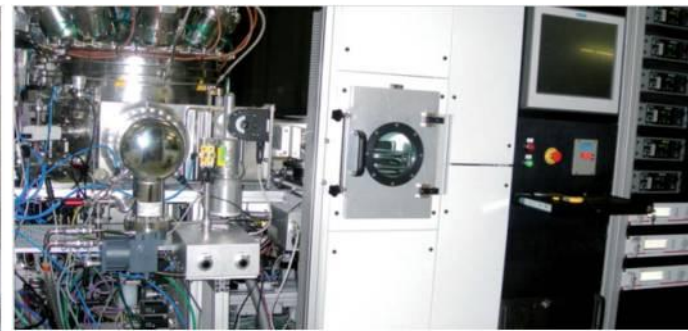
“The ambition of both countries is to create a research site of world scale relevance, capable of attracting scientists and technicians from all points of the world”

Minister of Science, Technology and Higher Education, Portugal, 2005



INL – International Iberian Nanotechnology Laboratory, at Braga, Portugal

Sample of installed Scientific equipment



General Concept

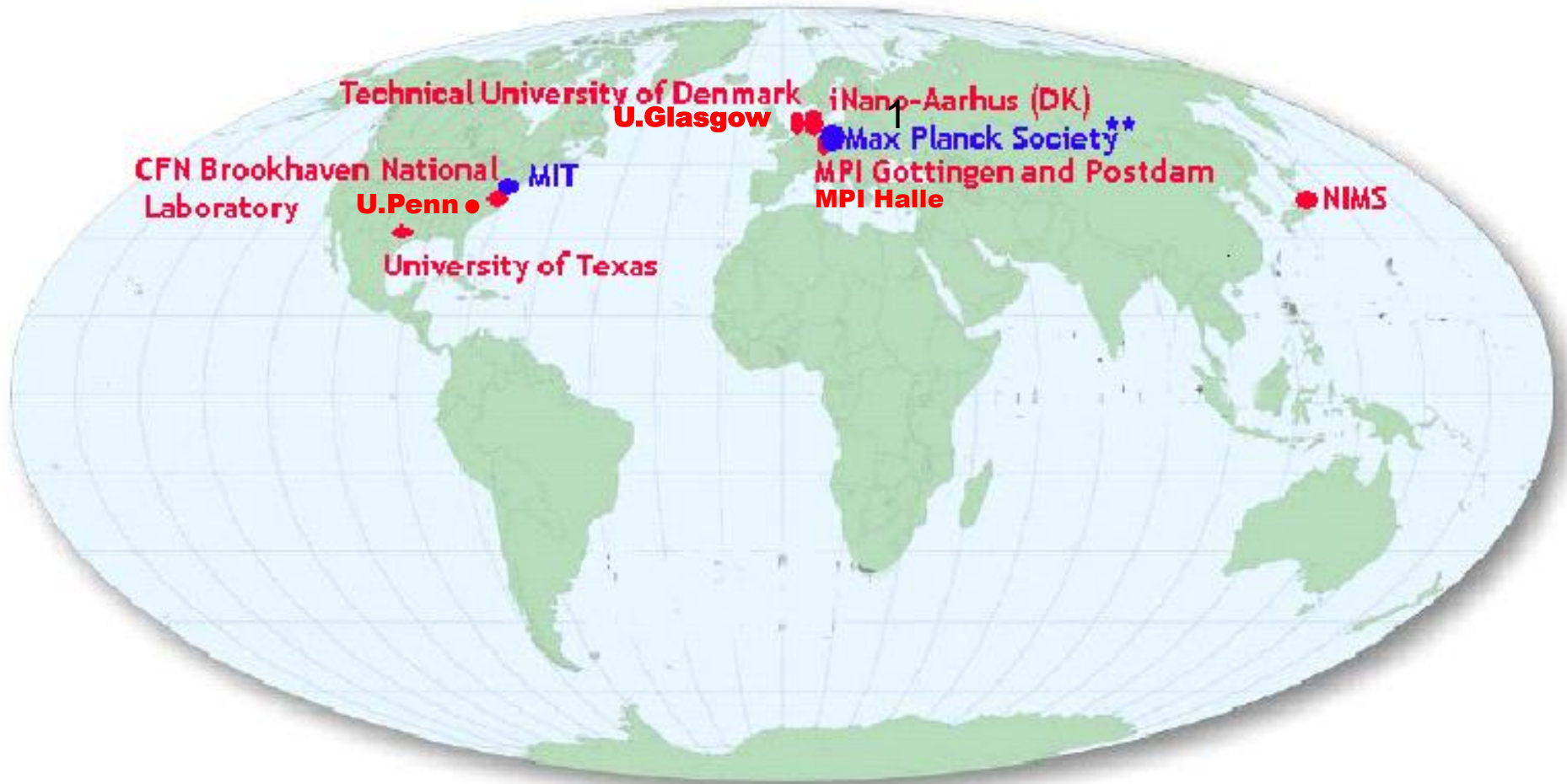
200 researchers, 400 people. Scientific staff recruited worldwide.

Founding requisites:

- World class research excellence in all areas of activity:
 - Nanomedicine (drug delivery, nanotechnology for diagnostics) ●
 - Environmental Applications ● Food and Water Quality Applications ●
 - Nanotechnology Safety and Impact in Society
 - Electronic Nanosystems (NEMS/MEMS, Spintronics, Photonics, Organic electronics) ● Nanomachines and Nanomanipulation
- Develop partnerships with industry and foster knowledge transfer
- Train researchers and contribute to developing a skilled workforce for the nanotechnology industry
- Prevent and mitigate nanotechnology risks



INL Networking Worldwide: Post Docs



10 Collaboration Agreements signed

INL Networking in Iberian Peninsula

Portugal-Spain Joint Projects

72 proposals, 10 approved projects with
36 Portuguese research teams + 36 Spanish research teams



18 PhD students carrying out their thesis in 18 Research groups

9 Portuguese Laboratories and 9 Spanish Laboratories

Covering different research areas and topics



INL – MIT Collaboration (agreed in 2009)

- Dynamic and sustainable **Joint Research Agenda** through **Shared-Facilities** and a **Joint Program for the Recruitment of 5 Senior Research Leaders** (“INL-MIT Distinguished Scientists”). Work to initiate at MIT, then move to INL, followed by periods at MIT (total time at MIT generally 1/3 but possibly up to 1/2 of 5 years)
- Collaboration concerning particularly **promising research** leading to scientific contributions of major international relevance for nanoscience and nanotechnology through **joint research projects** directed by an MIT senior faculty member, with 2/3 of the funding spent at INL, people at both INL and MIT, and mutual visits to build up complementary capacities at INL in the the general area of Nano-Materials, Nano-Devices, and Systems for Environmental Sensing and Nanomedicine, on the following themes:
 - ❖ Self-Powered Systems for Autonomous Sensing for Biomedical and Other Applications
 - ❖ Graphene-based Microsystems for Environment and Food-Quality Monitoring
 - ❖ Complex Molecular Self-Assembly Routes to Device Fabrication
 - ❖ Nanomaterial Arrays for Energy Storage and Sensing
 - ❖ Nanoparticle Engineering for Environmental Applications
 - ❖ Computational Modeling and Engineering in Nanotechnology



INL – MIT Collaboration (agreed in 2009)

- ➔ **Competitive Research Award Grants following open calls** for collaborative research projects involving 1 INL team and 1 MIT team and, whenever adequate, research teams of other institutions in both Portugal and Spain
- ➔ **Research residences and research internships** of MIT faculty and students at INL
- ➔ **Joint Conferences and Workshops**
- ➔ **Institutional involvement** at MIT:
 - ❖ Microsystems Technology Laboratory (MTL)
 - ❖ Materials processing Center (MPC)
 - ❖ Center for Computational Engineering (CCE)
 - ❖ New NSF center at MIT, International Material Institute on Nanostructure to Infrastructure to Sustainability
 - ❖ Other units of the College of Engineering
- ➔ **Governance:** INL- MIT Governing Board



5 General Practical Rules

in addressing R&D transatlantic cooperation challenges

- **Develop human capital**
- **Foster partnerships and sustainable Knowledge Networks**
- **Aim at outcomes, establish clear targets, and measure**
- **Leave room for bottom up creativity and flexible organizational adjustments**

