Directorate of Engineering International Collaborations

The U.S. National Science Foundation

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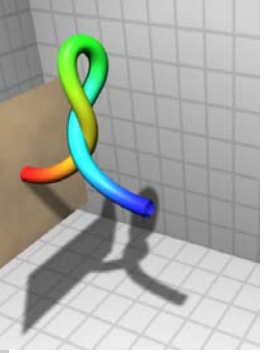


Dynamical Systems

Eduardo Misawa

- Program Goal:

" Fundamental advances in the understanding, design and operation of dynamic systems, such as nonlinear, hybrid, time-varying, multi-energy domain and distributed dynamical systems "

Examples of application areas:

- biological systems
- micro and nano-scale systems
- multi-scale dynamic systems
- large-scale complex systems
- integrated analysis and design of dynamic systems
- simulation-based engineering and science.
- acoustics and vibration analysis
- noise and vibration control

Control Systems Program

Mario Rotea

Goal

- To enable research and education in the prediction and control of complex dynamic systems
- Focused on civil, mechanical, and aerospace systems [CMAS]

Areas of Emphasis

- **Control Theory:** mathematical frameworks and tools to analyze and design control systems
- **Control Technology:** integration of sensing, actuation, and computation; innovative actuation concepts

Control Theory Challenge

- Clever utilization of the mathematical/physical structure/properties of CMAS to create powerful problem-specific methods and algorithms
- If not done correctly will not be able to control
  - Hybrid systems with continuous dynamics and discrete modes
  - Heterogeneous systems at multiple scales
  - Distributed mobile systems

Control Technology Challenge

- Attaining high [embedded] functionality with limited sensing, actuation, and computation

National Science Foundation Modes of Support

- Individual projects
- Instrumentation
- Large-scale facilities
- Fellowships, traineeships, research assistantships, post-doctoral funding
- Centers
  - Research
  - Science and engineering education
- Small Business Innovation

NSF
Key Proposal Review Criteria

- What is the intellectual merit of the proposed activity?

- What are the broader impacts of the proposed activity?

Note: All proposals are peer-reviewed

Existing International Efforts on Smart Materials and Smart Systems

- US-Europe Collaboration
- US-Japan Collaboration
- US-China Collaboration

Goals of International Collaborations

- Assessment of the state-of-the-art and key players
- Develop collaborations and expertise
- Innovation through collaborative international research

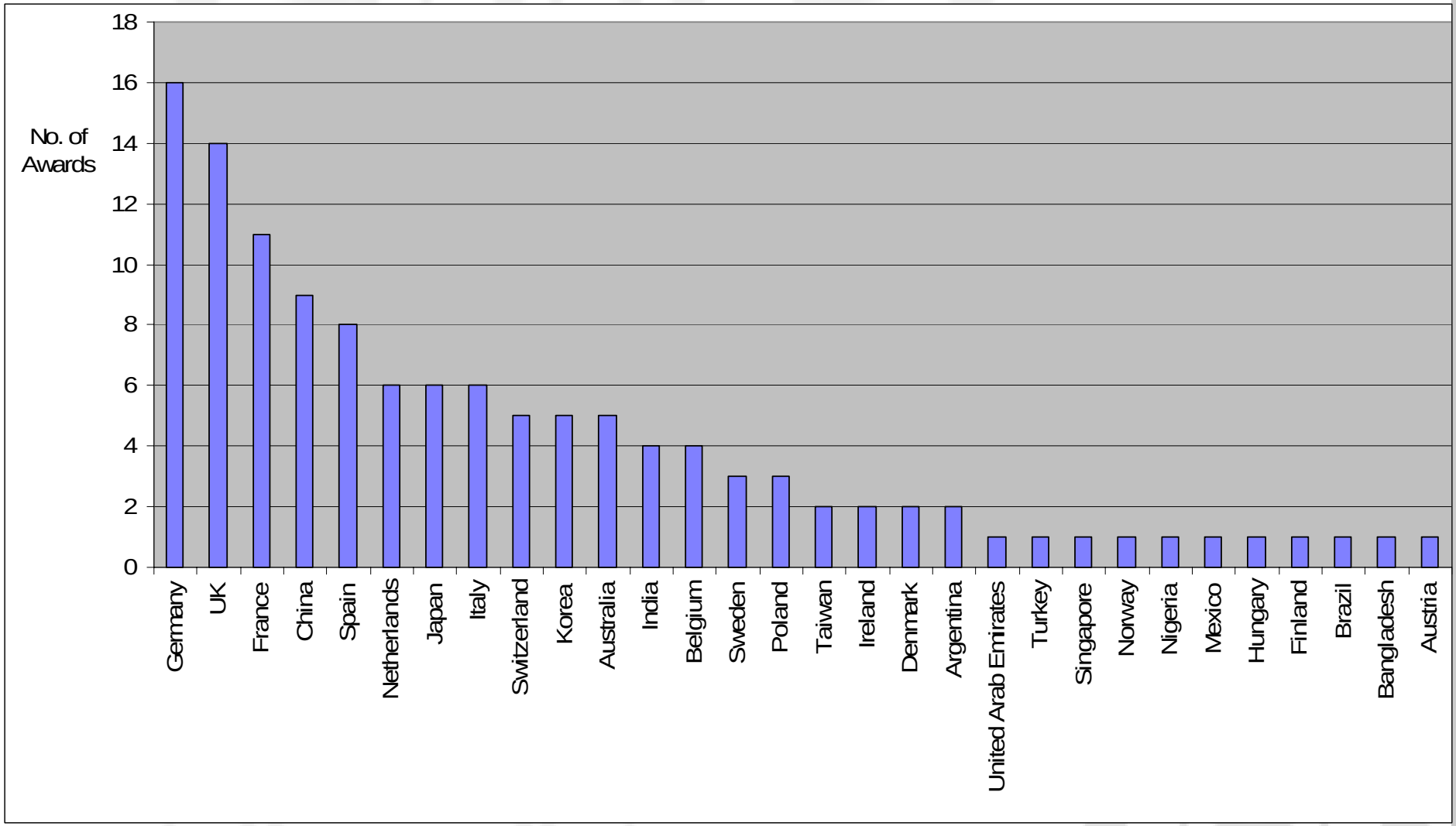
Mechanisms for International Collaboration

- Program Funds
- Engineering Funds (e.g. IREE)
- Office of International Science and Engineering

IREE: International Research and Education in Engineering

- Opportunity for international research and education for early-career researchers (undergraduates and graduate students, postdoctoral fellows, junior faculty members)
- Supplement for existing NSF awards
- Medium duration visits to collaborating institutions and laboratories outside the U.S.
- Research must be related to ongoing work
- Evidence of engagement in cultural activities in the countries visited

IREE – Statistics



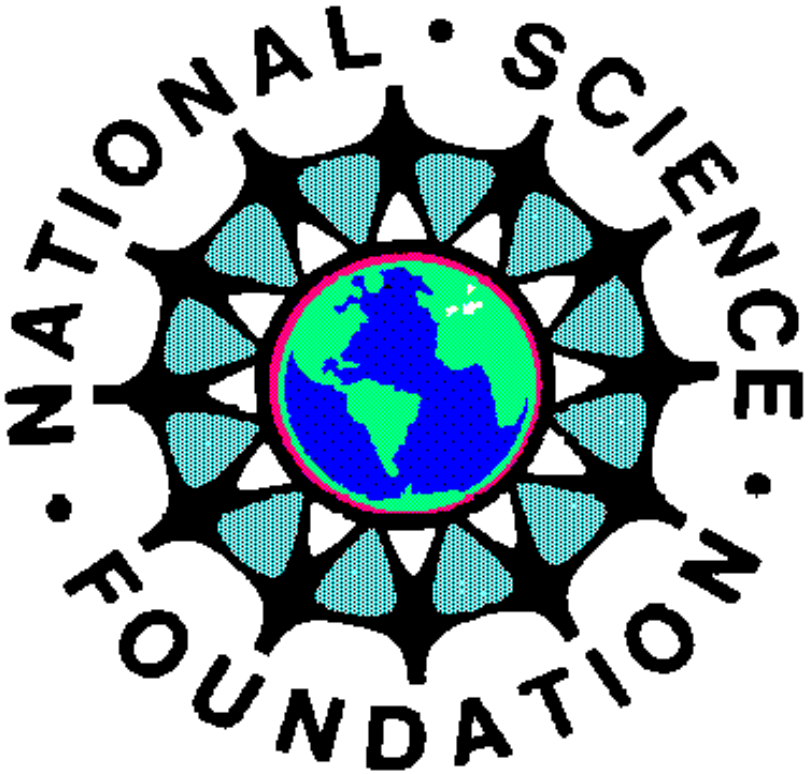
Total: 113 awards made, US$3.3M

Planning Awards

- International Planning Visit/Workshop Awards support the initial phases of developing and coordinating integrated research and education activities with foreign partners.
- Support for travel and subsistence expenses
  - Planning visits
  - Joint workshops
- It is expected that most Planning Visit/Workshop Award grantees will subsequently apply to disciplinary programs across the National Science Foundation for support of the resulting collaborative research.

PIRE

- Partnerships for International Research and Education (PIRE) seeks to catalyze a cultural change in U.S. institutions by establishing innovative models for international collaborative research and education. The program will enable U.S. institutions to establish collaborative relationships with international groups or institutions in order to engender new knowledge and discoveries at the frontier and to promote the development of a globally-engaged, U.S. scientific and engineering workforce.



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