INTERNATIONAL RESEARCH AND EDUCATION IN ENGINEERING (IREE)

Motivation and Implications

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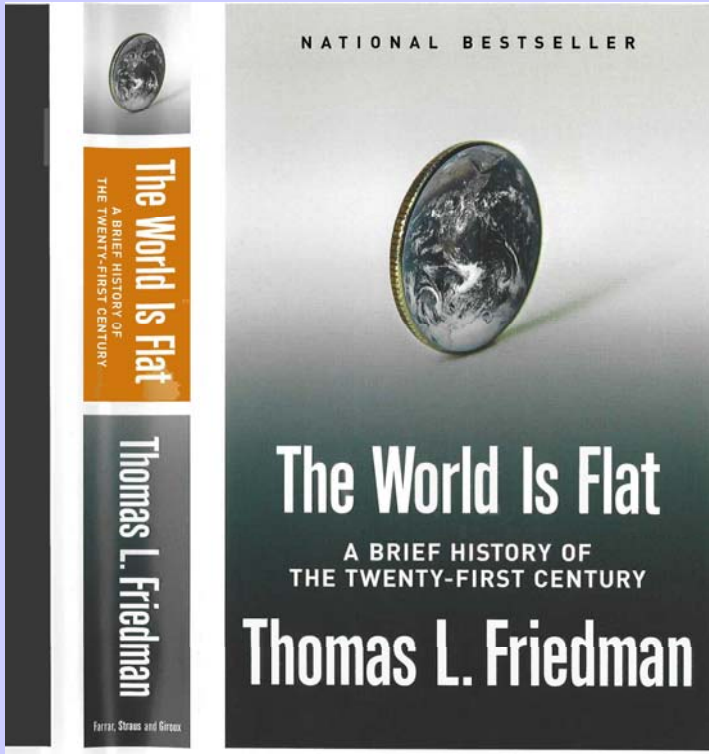
IREE Objectives

- Leverage international partnerships to enhance education and research innovations in U.S.
- Enhance international perspective for U.S. early-career faculty and students

The Current Realities

- New developments in science and technology are leading to new opportunities, and new needs for support, in engineering research and education.
- In research, budget pressure is limiting academia in innovation.
- In education, faculty and students have limited opportunities to acquire *meaningful* global perspective useful for 21st century.
- Few programs in NSF / ENG openly encourage their communities to include international cooperation in proposals.
- Meanwhile, in many parts of the world, increasing wealth has led to increasing investments for education and technology development.

"The flattening of the world…has presented us with new opportunities, new challenges, new partners…"



IREE: INTERNATIONAL EXPERIENCE

- Addresses ABET Criterion: *"[Engineering programs shall provide] broad education necessary to understand the impact of engineering solutions in a global, environmental, and social context"*
- Provides graduates with international experience that is in high demand by industry
- Responds to deans' interest to send 20-25% of classes overseas, but who encounter funding and scheduling problems
- By-passes obstacle posed by most international programs, that are based on reciprocity arrangements

IREE: A Entirely New Approach by NSF

- Initiated as pilot in 2006
- Completely funded by NSF: No need for PIs to make cumbersome reciprocity arrangement
- Broaden domestic research and education
- Tap into new ideas worldwide
- Leverage resources of global partners

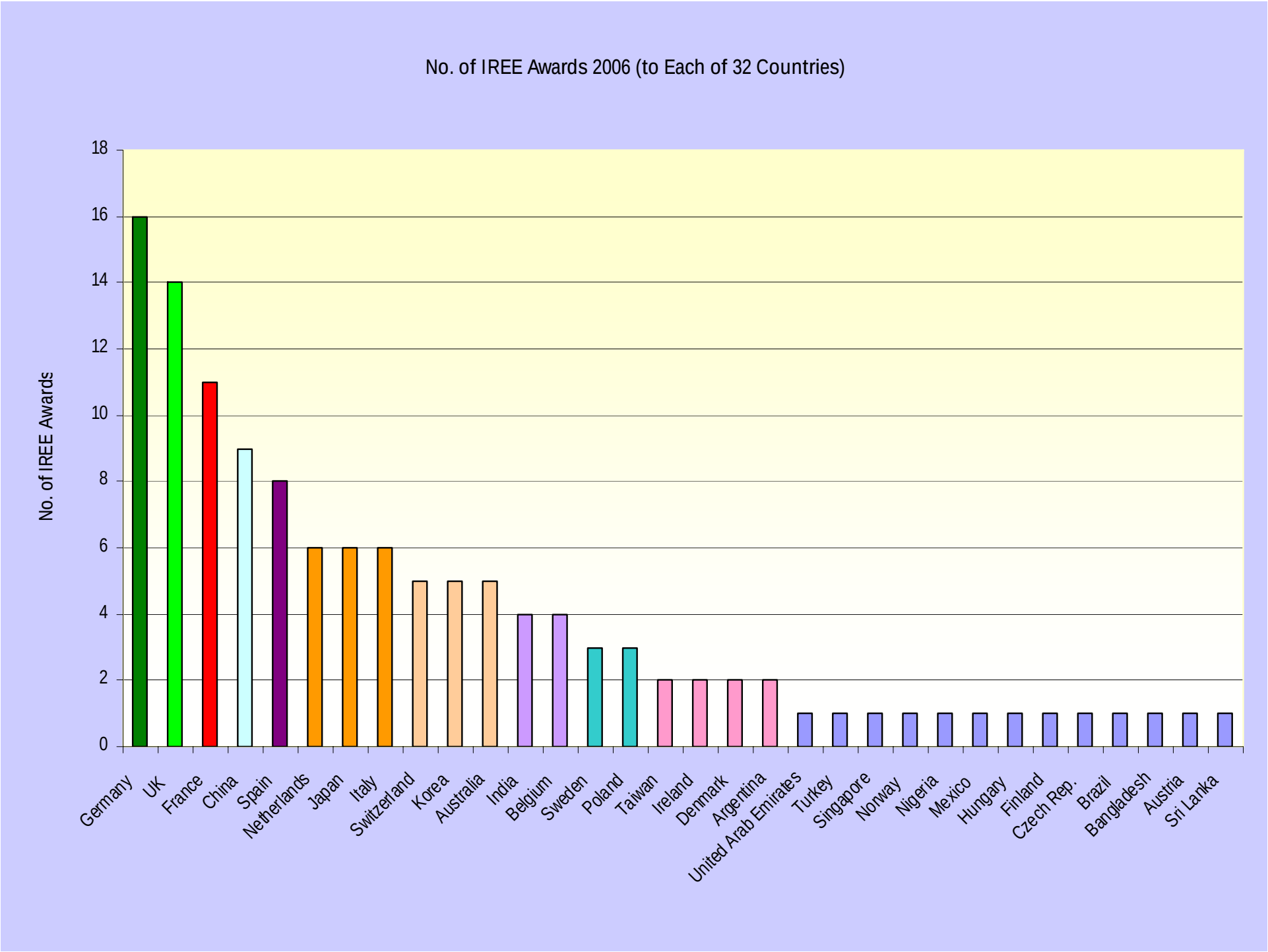
2006 & 2007 Strategic Approach

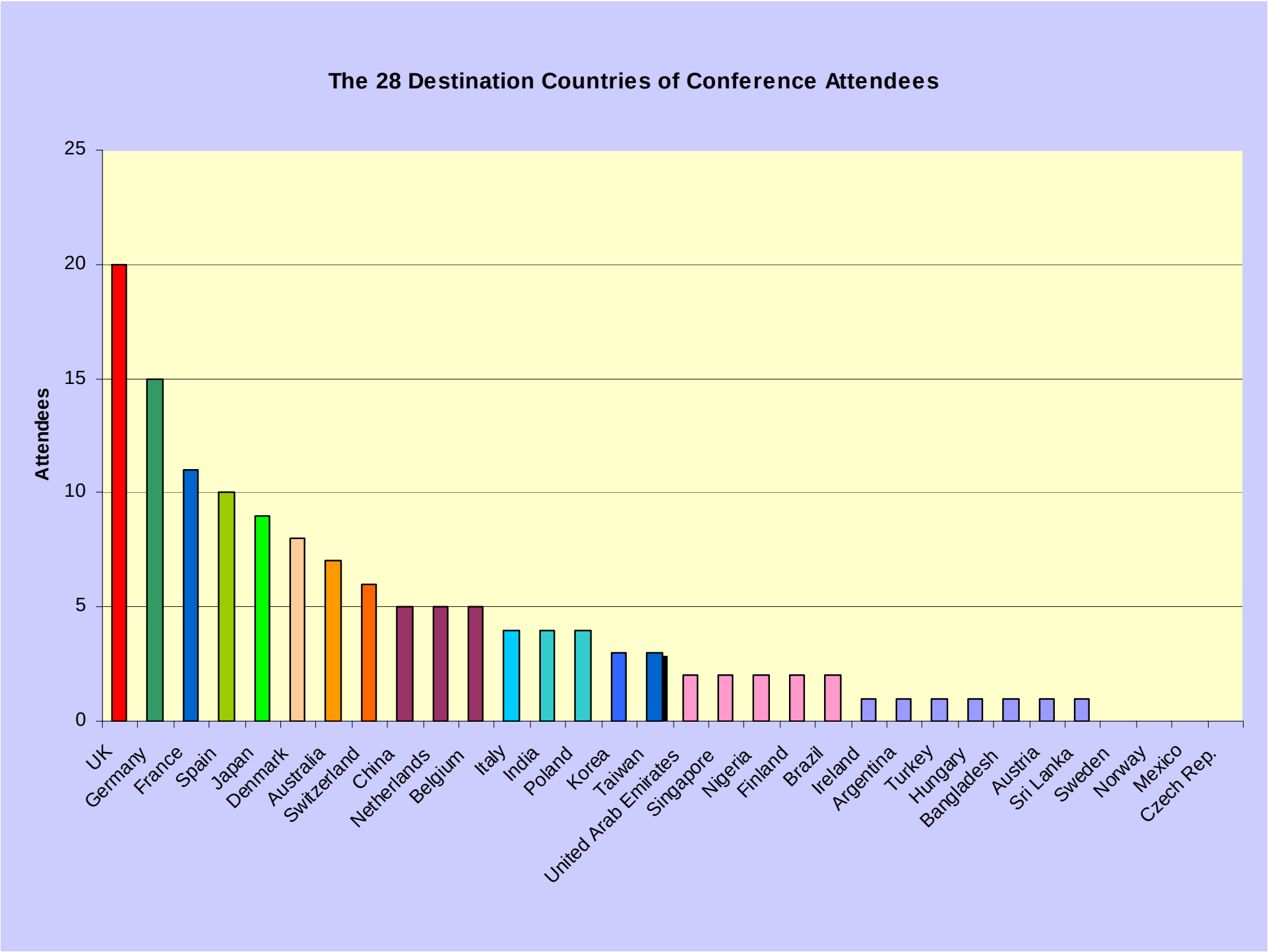
- ENG/EEC to target an initial spending of $1,000,000 approx. and allow PDs to contribute co-funding voluntarily
- Focus on medium duration (3-6 mo.) travels to foreign institutions/laboratories
- Target early-career researchers

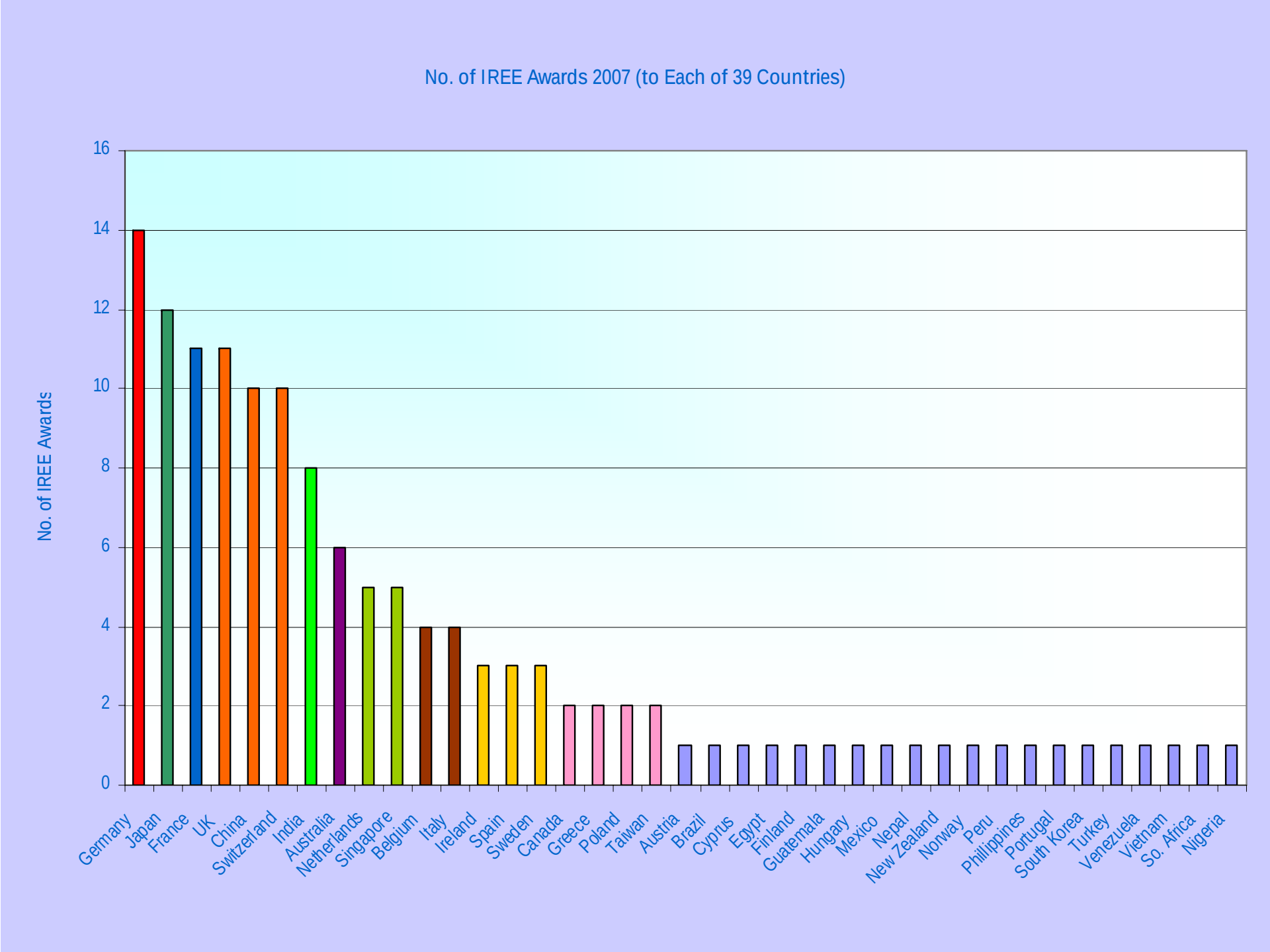
ELIGIBILITY REQUIREMENTS

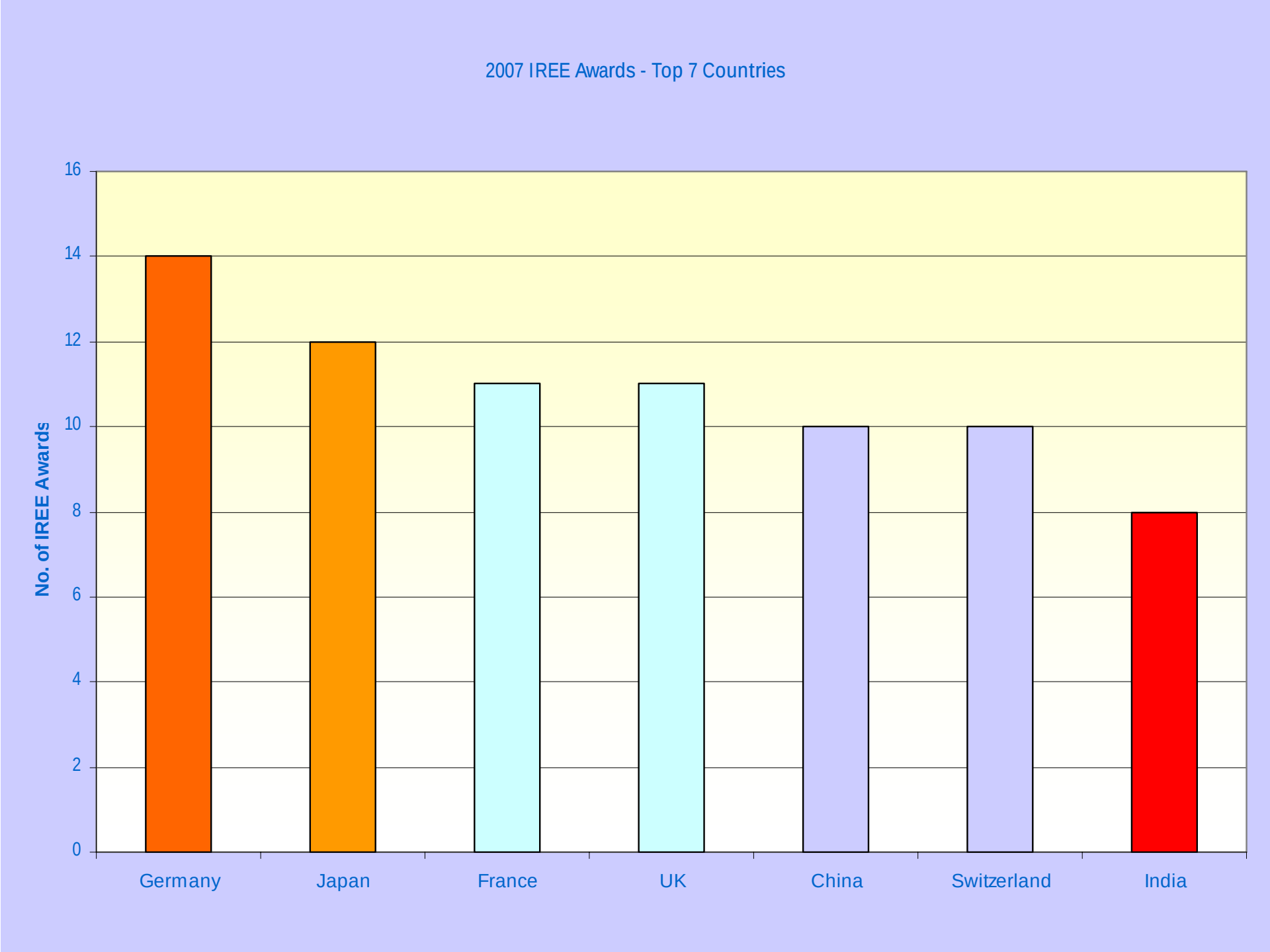
- Undergraduate and graduate students; Post-docs.; Assistant and Associate Professors working on current awards funded by divisions in ENG.
- Work must be related to the objectives of ongoing work in current projects, augmented by evidence of engagement with the cultural activities in the countries visited.
- Travel of researchers at assistant or associate professor levels must also include at least one student.
- New for 2007: Researchers must be U.S. citizens or permanent residents.
- Trip report to NSF within 3 mo. after trip.
- IREE Workshop in Fall, 2007 and 2008.

	FY 2007	FY 2006
IREE FUNDS:	$1,000,000	$981,684
PROGRAM FUNDS:	$1,225,891	$678,620
OISE FUNDS:	$1,684,656	$1,606,699
TOTAL FUNDS:	$3,910,547	$3,269,003
TOTAL REQUEST:	$4,925,838	$7,137,342
NO. OF PROPOSALS:	152	177
NO OF AWARDS:	132	115
NO. WITH IREE FUNDS:	96	56
$ SUCCESS RATE:	79%	46%
PROPOSAL SUCCESS:	87%	65%


No. of IREE Awards 2006 (to Each of 32 Countries)
No. of IREE Awards
0
2
4
6
8
10
12
14
16
18
Germany
UK
France
China
Spain
Netherlands
Japan
Italy
Switzerland
Korea
Australia
India
Belgium
Sweden
Poland
Taiwan
Ireland
Denmark
Argentina
United Arab Emirates
Turkey
Singapore
Norway
Nigeria
Mexico
Hungary
Finland
Czech Rep.
Brazil
Bangladesh
Austria
Sri Lanka

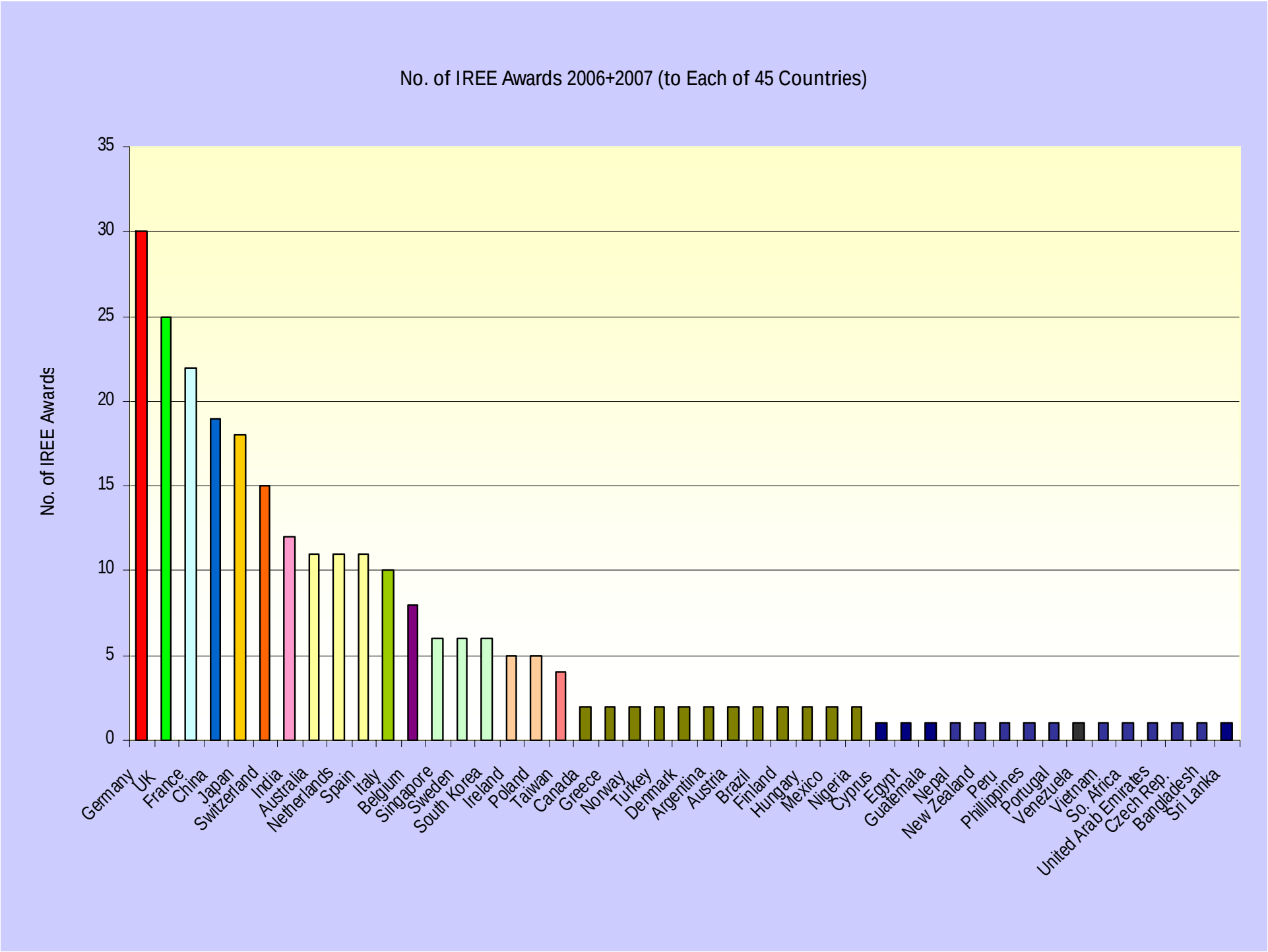

The 28 Destination Countries of Conference Attendees
Attendees
25
20
15
10
5
0
UK
Germany
France
Spain
Japan
Denmark
Australia
Switzerland
China
Netherlands
Belgium
Italy
India
Poland
Korea
Taiwan
United Arab Emirates
Singapore
Nigeria
Finland
Brazil
Ireland
Argentina
Turkey
Hungary
Bangladesh
Austria
Sri Lanka
Sweden
Norway
Mexico
Czech Rep.

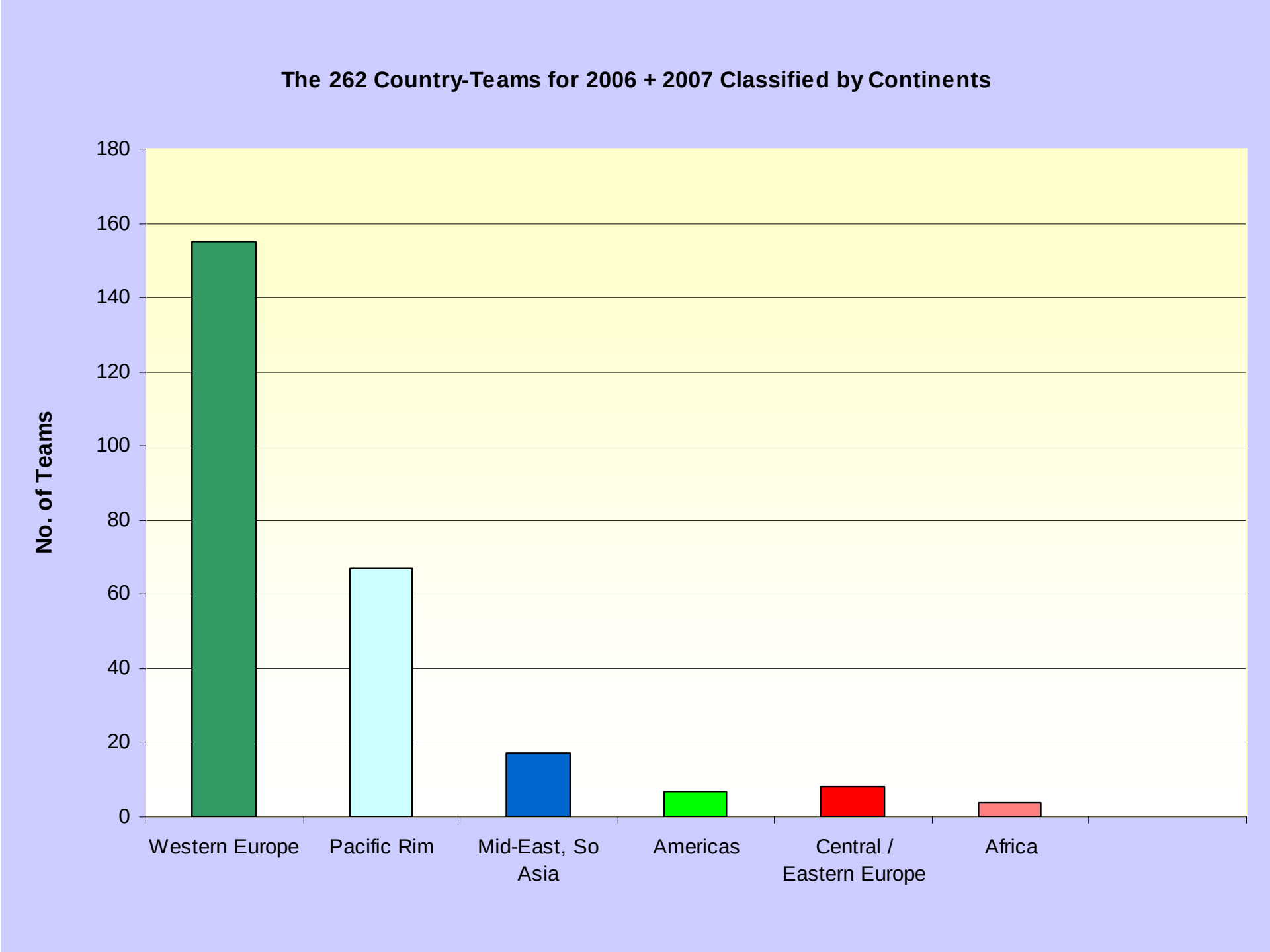

No. of IREE Awards 2007 (to Each of 39 Countries)
No. of IREE Awards
16
14
12
10
8
6
4
2
0
Germany
Japan
France
UK
China
Switzerland
India
Australia
Netherlands
Singapore
Belgium
Italy
Ireland
Spain
Sweden
Canada
Greece
Poland
Taiwan
Austria
Brazil
Cyprus
Egypt
Finland
Guatemala
Hungary
Mexico
Nepal
New Zealand
Norway
Peru
Phillippines
Portugal
South Korea
Turkey
Venezuela
Vietnam
So. Africa
Nigeria


2007 IREE Awards - Top 7 Countries
No. of IREE Awards
16
14
12
10
8
6
4
2
0
Germany
Japan
France
UK
China
Switzerland
India

SUMMARY FOR 2006 & 2007

EEC Base Funding:	$1,981,684
ENG Divisions Co-Funding (incl. EEC):	$1,904,511
OISE Co-Funding:	$3,291,355
Total Funding:	$7,177,550
Total Requested Budget:	$12,063,180
Funding Rate:	59%
Number of Proposals:	329
Number of Supplement Awards:	247
Number of Country-Teams:	262
Proposal Success Rate:	75%
No. of Students Funded (Estimated):	352
No. of Early-Career Faculty Funded (Estimated):	176
Total:	528


No. of IREE Awards 2006+2007 (to Each of 45 Countries)
No. of IREE Awards
35
30
25
20
15
10
5
0
Germany
UK
France
China
Japan
Switzerland
India
Australia
Netherlands
Spain
Italy
Belgium
Singapore
Sweden
South Korea
Ireland
Poland
Taiwan
Canada
Greece
Norway
Turkey
Denmark
Argentina
Austria
Brazil
Finland
Hungary
Mexico
Nigeria
Cyprus
Egypt
Guatemala
Nepal
New Zealand
Peru
Phillippines
Portugal
Venezuela
Vietnam
So. Africa
United Arab Emirates
Czech Rep.
Bangladesh
Sri Lanka


The 262 Country-Teams for 2006 + 2007 Classified by Continents
No. of Teams
180
160
140
120
100
80
60
40
20
0
Western Europe
Pacific Rim
Mid-East, So Asia
Americas
Central / Eastern Europe
Africa

IREE Conference 2007

- October 30 – November 1, 2007, Purdue University
- Dan Hirleman, Head, School of Mechanical Engineering
- Fast-Track Proposal Preparation, Submission, Action:

8/22/2007: Hirleman expressed initial interest
8/23/2007: Hirleman submitted proposal
8/24/2007: IREE Program funding recommendation
8/28/2007: NSF award letter to Purdue sent by NSF / DGA

Impact: 2006-2007

- IREE has sent a powerful message about NSF's interest in leveraging international cooperation to enhance innovations and international experience of young researchers, but its impact so far is small compared with the size of the population in 4,500 current awards in ENG.

- Less than 4% of PIs in eligible ENG awards responded each year (177 and 152, resp., in 2006 and 2007 out of 4,500) and fewer than 3% of current awards received funding (115 and 132, resp., in 2006 and 2007 out of 4,500), but IREE has helped focus *ENG divisions'* strong interest to support international cooperation in research and education.

FEEDBACK ON IREE

"…This IREE funding enabled three U.S. researchers to build bridges to two research organizations with interests and skills complementary to ours."

"This visit created a pathway for complex applications of ongoing research under the CAREER award and greatly enhanced the quality of our ongoing work by establishing stronger links…With our international collaborators, we have written journal papers and have collaborated on grant proposals."

"…the primary message to take away is the great value of the program. In addition to specific research accomplishments, there were many long-term, positive outcomes."

"All the participants viewed this as a tremendous opportunity for personal and professional growth and greater understanding of our global community. The less-visible, more personal impacts are among the most compelling reasons to continue and expand the IREE program."

FEEDBACK ON IREE

"…provided the opportunity for Ms. Ghylin to enhance her research capabilities while building ties with an international university. It further provided the opportunity for her to get first-hand knowledge of international upcoming technology and business and government practices..."

"As a consequence of his visit, we now know that ATRP may be used to make adsorptive ion exchange membranes…Thus ATRP could be a valuable new technology for manufacturing high capacity ion-exchange membranes."

"One important scientific accomplishment was to show the significant difference between fluorescence from aluminum and gold nanocavities…"

"…we have established what we expect to be a longer-term collaboration and exchange between the two groups, which is significant in its own right."

"The IREE program is of high value and impact and should definitely be supported on an on-going, NSF-wide basis. Much of its value lies in the fact that this type of travel support is difficult to obtain through other sources."

MORE FEEDBACK ON IREE

"…The University of …..was awarded grant ….. in order to investigate the possibility of imaging cancerous tunors (*sic*) in the breast using microwave imaging. For this purpose ….. traveled to the Université de Technologie Troyes during the summer of 2007. Unfortunatly (*sic*), no significant progress was made on this objective..."

IREE Outcomes

- A systematic analysis of specific outcomes and accomplishments attained by early-career IREE grantees is needed.

- Experience of IREE award recipients will prove invaluable in research on benefits of globalization on engineering education.

- The IREE reports to be published in conference proceedings will be a useful resource for future analysis and research.

THANK YOU!