

Deutsche
Forschungsgemeinschaft

Partnerships for International & Interdisciplinary Research in Engineering

Programs
Possibilities
Perspectives

Marion Müller
Newport, Rhode Island, November 6, 2008



DFG

And This Is What You Can Expect:

- 1. Introduction: Facts & Figures about DFG**
- 2. Meeting the challenge of interdisciplinarity**
- 3. Internationalisation – why and how?**
- 4. Points for Discussion**



1. Introduction: Facts & Figures about DFG

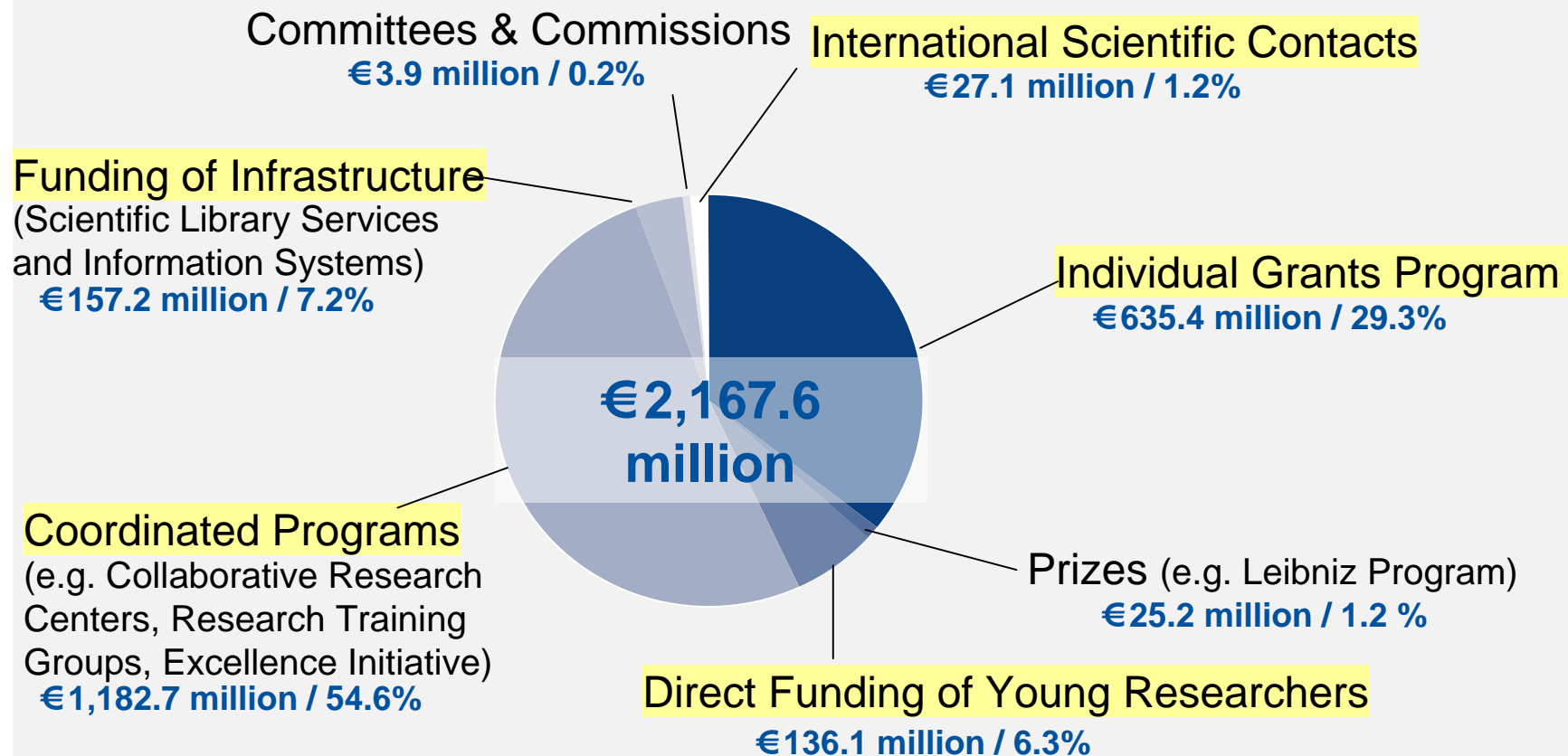
2. Meeting the challenge of interdisciplinarity
3. Internationalisation – why and how?
4. Points for Discussion

German Research Foundation DFG: Who We Are and What We Do



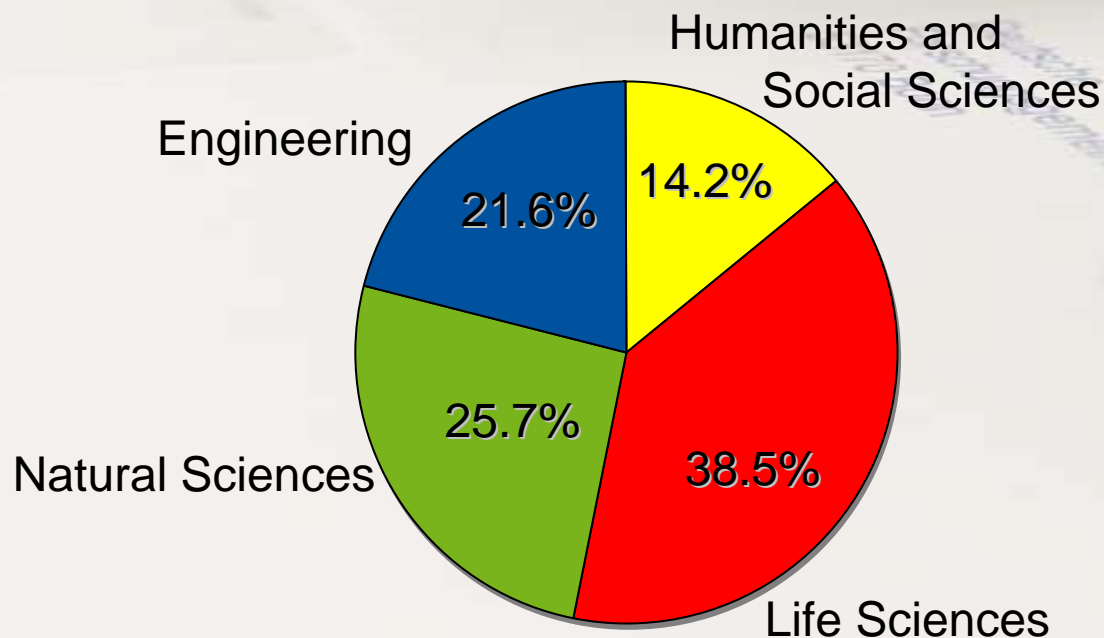
- central **public funding organization** for academic research in Germany (largest in Europe)
- **member organization** (universities, learned societies)
- serving **all fields** of science and the humanities including medicine
- promoting **academic excellence** on a competitive basis
- independent multi-tiered **peer review**
- **advisory function** for politics
- special focus on supporting **young academics**
- promoting **international research cooperation**
- fostering **links** between **science and industry**

DFG Programs: Funding 2007



yellow: programs that can include international components

Distribution of Research Funding by Scientific Discipline 2007



Budget

2001: 1.206 bn €

2002: 1.268 bn €

2003: 1.303 bn €

2004: 1.313 bn €

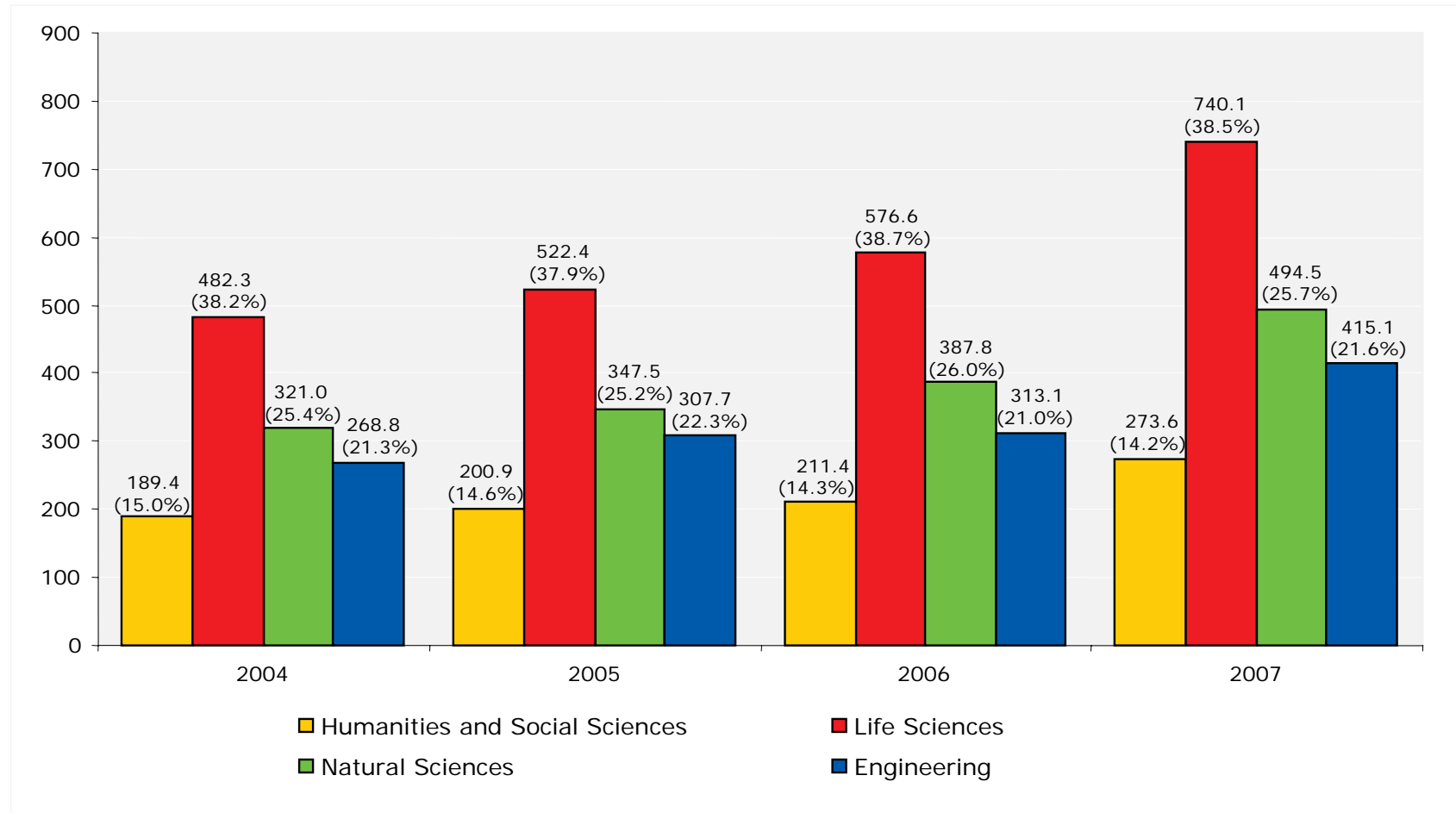
2005: 1.353 bn €

2006: 1.588 bn €*

2007: 1.923 bn €*

*including
funds for the
Excellence
Initiative

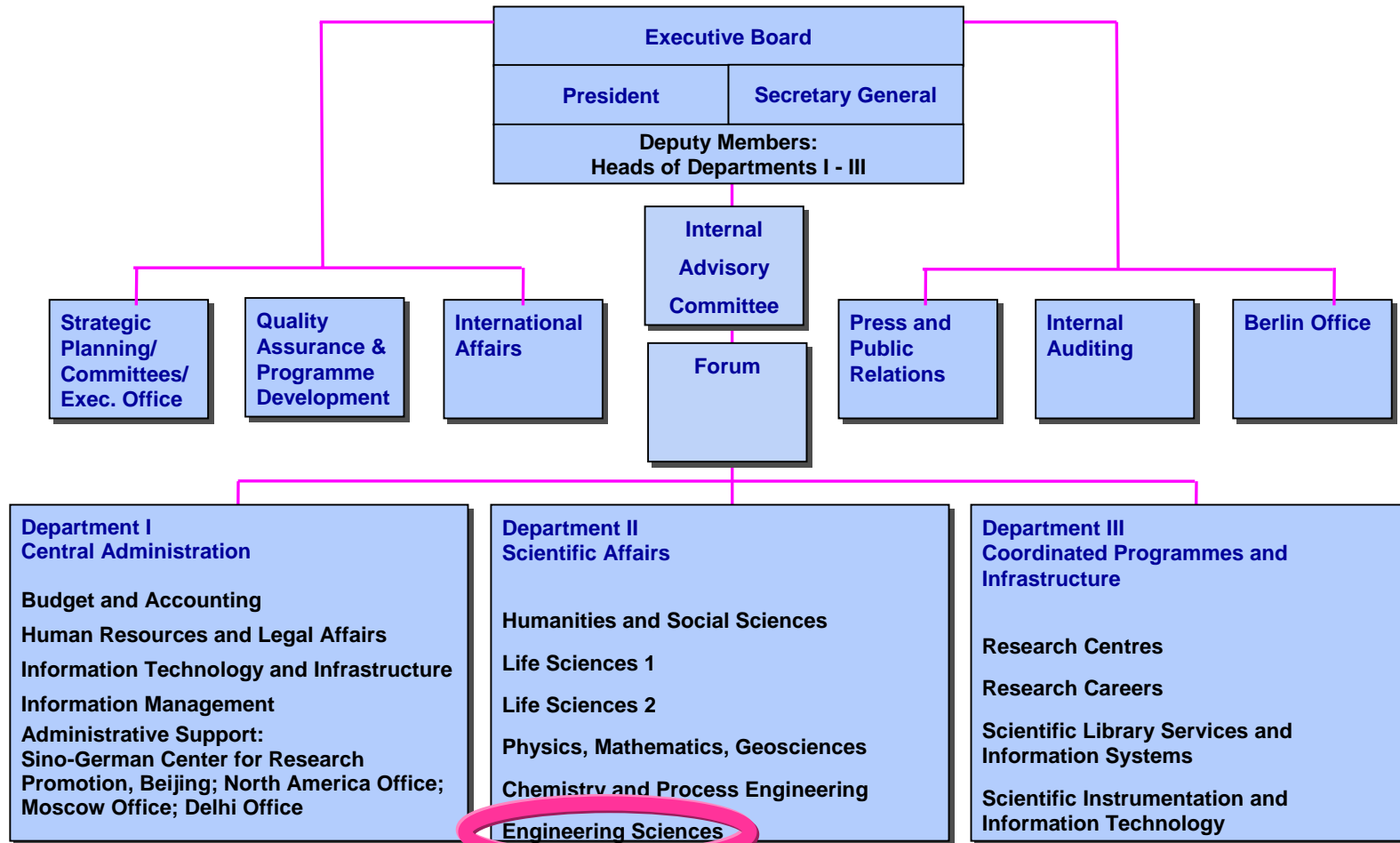
Distribution of Research Funding by Scientific Discipline in mio. €* 2004 – 2007



*on the basis of DFG Individual Grants Programs, Programs Promoting Young Researchers, Coordinated Programs
Source: DFG

- 
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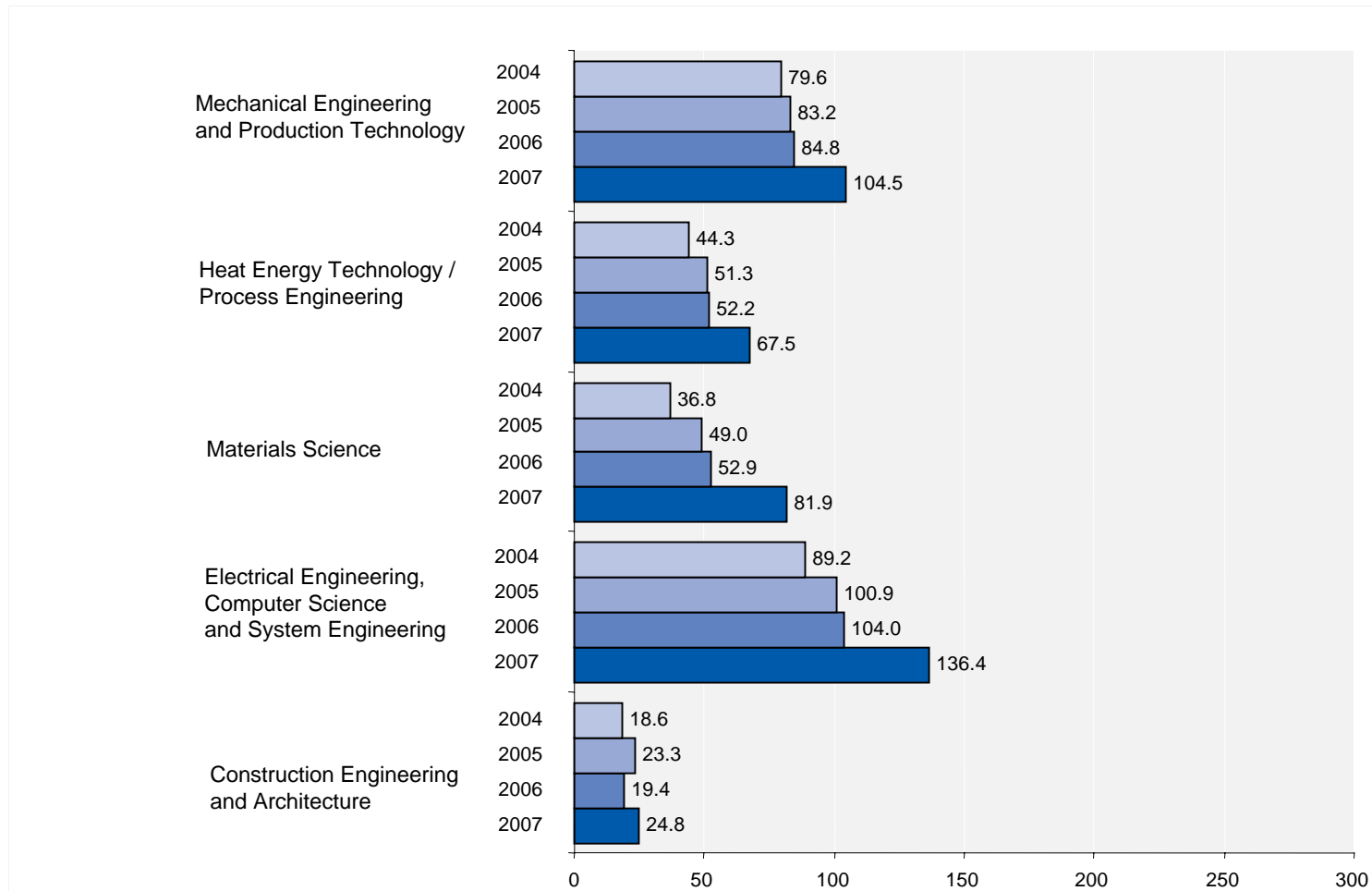
DFG Head Office Bonn



Department II – Scientific Affairs / Engineering Sciences

Scientific discipline	Research Areas	Review Boards (115 members)
Engineering sciences	Mechanical and industrial engineering	401 Production technology
		402 Mechanics and constructive mechanical engineering
	Thermal and process engineering	403 Process engineering and technical chemistry
		404 Heat energy technology, thermal machines and drives
	Material science and engineering	405 Materials engineering
		406 Materials science and raw materials
	Computer science, electrical and system engineering	407 System engineering
		408 Electrical engineering
		409 Computer science
	Construction engineering and architecture	410 Construction engineering and architecture

Research Funding,* Engineering Sciences 2004–2007 in mio Euro



Medical Technology

- prime example of a multidisciplinary research field with significant developmental potential
- current research findings from the relevant fields of medicine, engineering, computer science and the natural sciences open up new fields of application for medical technology in health care and lead to rapid growth in the importance of this discipline
- many innovative approaches fail due to hurdles caused by the high degree of interdisciplinarity and the communication difficulties which may arise therefrom

"Medical Technology" project group:

Goals and responsibilities:

- define important research fields for basic research by holding regular strategy workshops,
- support interdisciplinary collaboration in these fields by initiating the joint and coordinated review and cross-group funding of projects,
- promote young researchers by launching a "Medical Technology Action Plan" and
- coordinate programmes and projects with other research funding organisations.

Excellence Academy Medical Technology

Its goal is to enable excellent young researchers in the Natural and Life Sciences to:

- set up their own research group at an early career stage and according to international standards
- establish research networks in the area of medical technology at home and abroad through personal contacts to experts in science and industry
- lead a more independent research career than is otherwise the case within traditional university structures

Program:

Phase 1: one week of presentations, seminars, hands-on training, laboratory visits

Phase 2: competition for a project-related grant up to a maximum of EUR 50,000 for conducting a first small research project

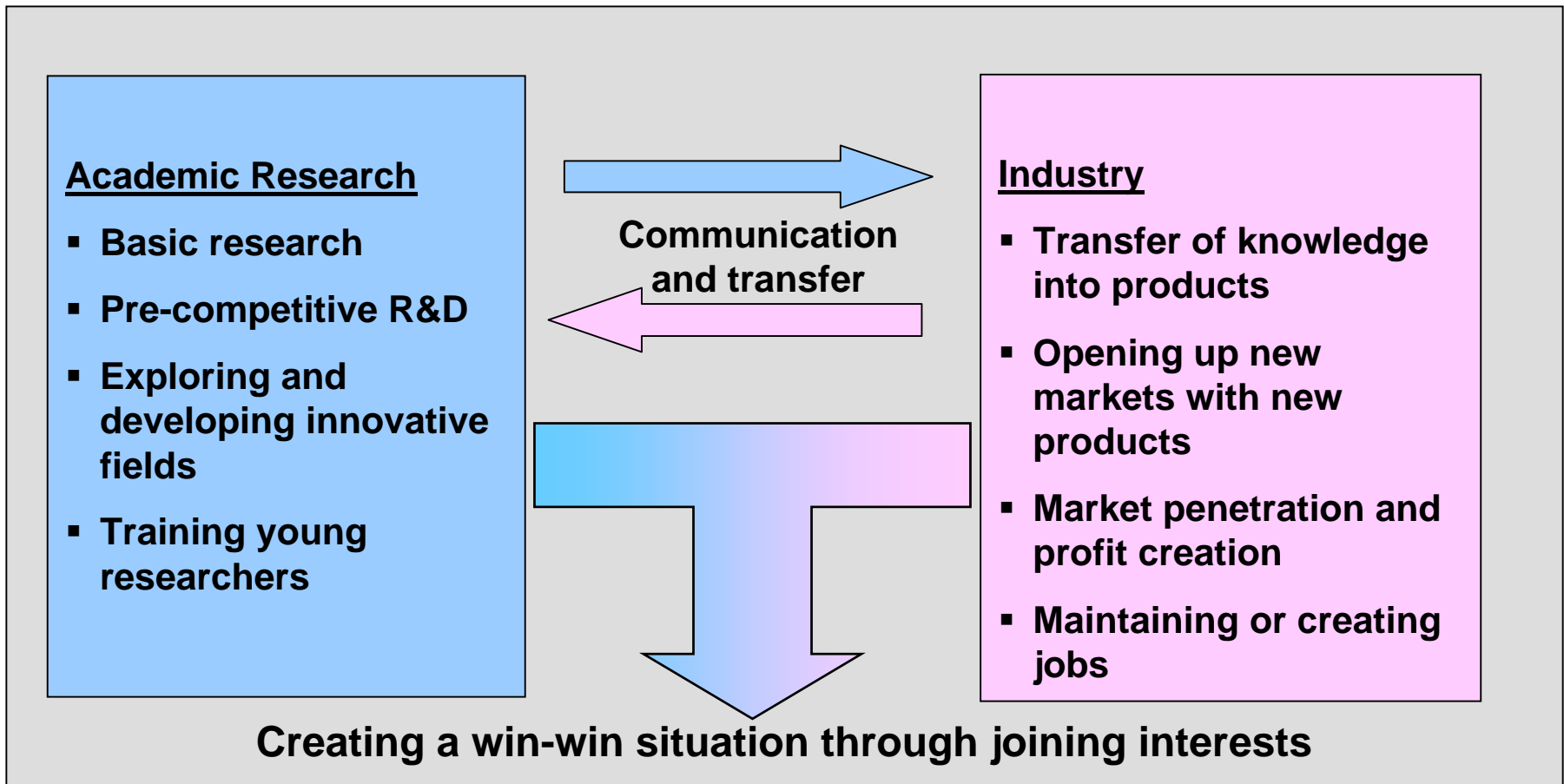
Eligibility:

- Young researchers from the fields of medical technology, natural and engineering sciences and medicine; prerequisite: doctoral degree (ideal: 12 months after receiving the doctorate); at least 35 years old

Requirements:

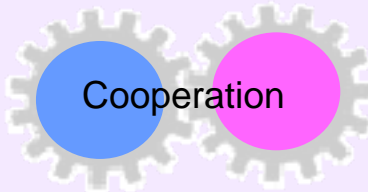
- outstanding track record and at least one scientific publication in an internationally renowned journal
- innovative idea in the field of medical technology relating to the main theme; first phase: project draft, second phase: submission of a detailed project proposal to the DFG

Disconnected Sectors?



DFG Transfer Projects/ Transfer Units

research
institutions



"User"

- Businesses
- Public authorities
- Hospitals
- Universities

- transferring the findings of **basic research** into the realm of practical application
- Funding restricted to the pre-competitive area, extending up to the prototype stage

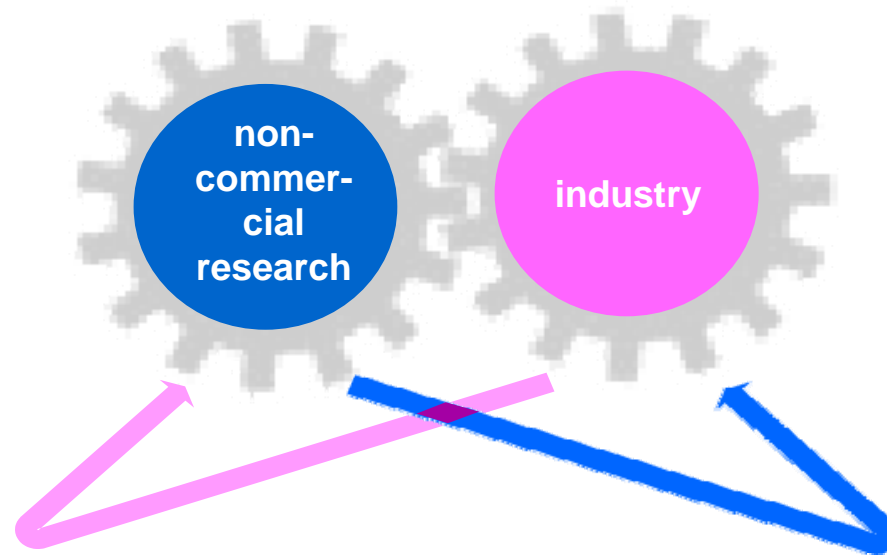
Goals:

- Evaluating research results under practical conditions
- Circulating the findings of the transfer units through publications
- Feedback for basic research
- For researchers: experiencing the regime of result-orientation and applying knowledge

2007:

approx. 150 transfer projects
with a volume of
10 million €/a

Joining Interests: A Win-Win Situation!



research's gain:

- the benchmark of practical application
- application-oriented know-how
- use of large equipment
- regional & international networks
- private sector funding
- top employees with practical background

industry's gain:

- broad basis in basic research
- excellent junior staff
- use of large equipment
- "fountain of youth"
- "factory of ideas"

DFG Funding – "Knowledge Transfer up to the Prototype" and "Knowledge Transfer through Mobility"

In **all DFG's funding programs**, **collaborative projects** between **science and industry** can be supported.

Basic principles:

- The DFG does not directly allocate funds to industry partners, **collaborating industry partners are expected to make an appropriate contribution**
- The DFG can cover costs for outsourcing, for joint financing of equipment, for **"Funding for One's Own Position"** etc.
- Commercial exploitation will be laid down in a cooperation agreement (university / industry)

Types of funding:

- 1) Funding up to the prototype
- 2) Funding "knowledge transfer through mobility"

Deutsche
Forschungsgemeinschaft



Transferprojekte –
Fördern bis zum Prototyp

Kooperationsmöglichkeiten
zwischen Wissenschaft
und Industrie



DFG
Ideenwerkstatt

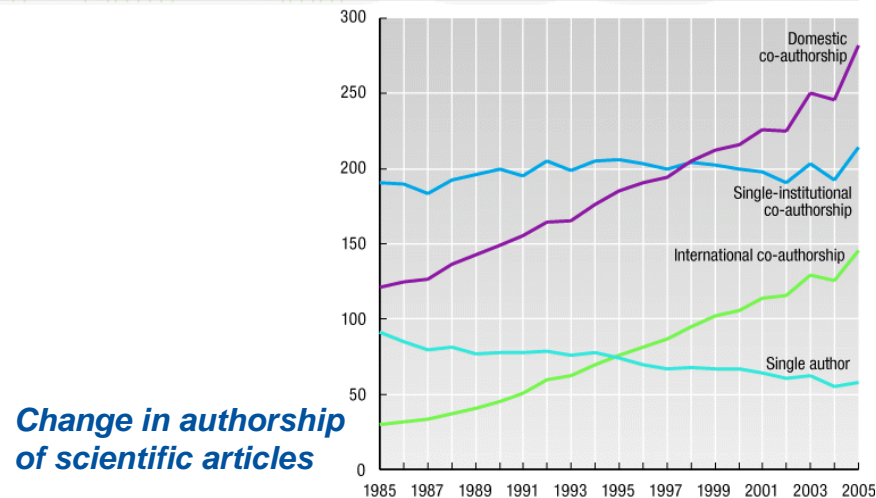
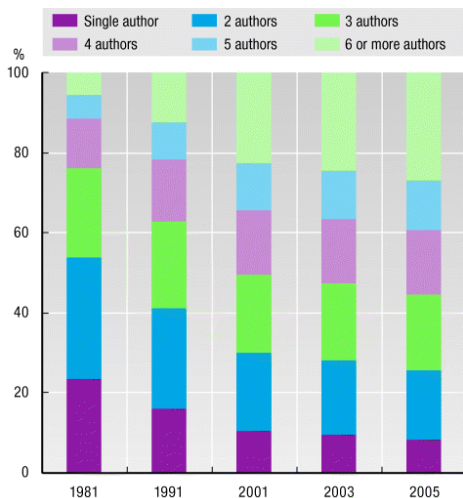
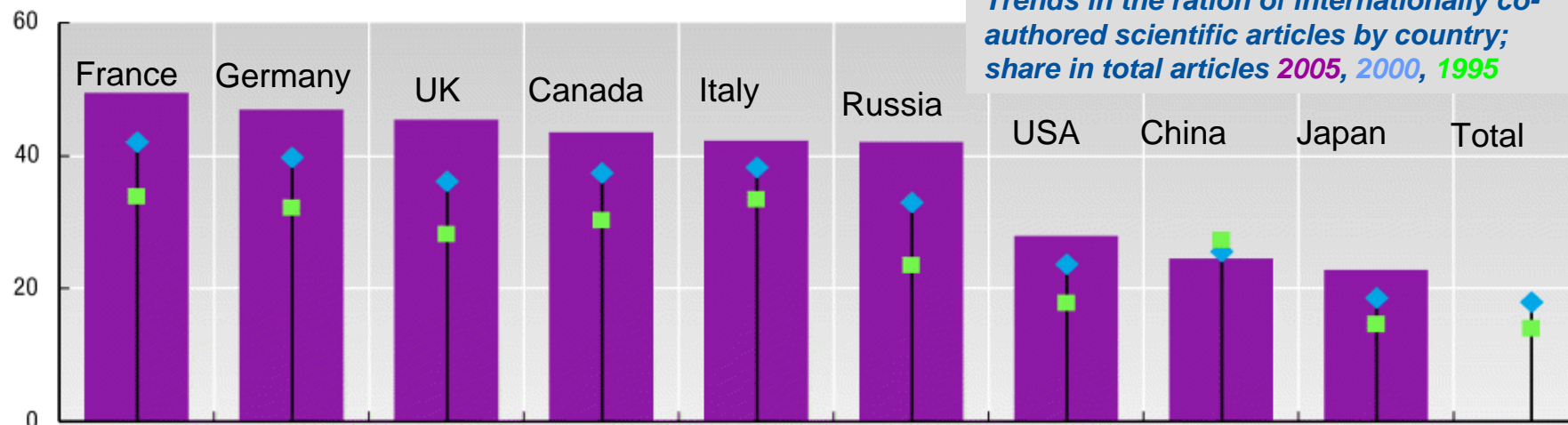
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No nation has a monopoly of knowledge, it has become the common heritage of civilized man, but its fruits are available to us only through cooperation.

Vijayalakshmi Pandit

International Collaboration in Science



Research Total Output and Collaboration

Country and abbreviation		1996-2000				2001-2005				Change in output	
		Output ('000s)	Output % world	Collab ('000s)	Collab % output	Output ('000s)	Output % world	Collab ('000s)	Collab % output	Volume increase as % 96-00	Collab increase as (%96-00)-(%01-05)
UK	UK	338.4	9	97.6	29	358.7	9	144.5	40	6.0	11.4
USA	USA	1262.3	35	244.9	19	1352.4	34	334.7	25	7.1	5.3
Canada	CAN	167.2	5	55.4	33	184.4	5	75.7	41	10.3	7.9
France	FRA	229.8	6	82.1	36	244.8	6	107.7	44	6.5	8.3
Germany	GER	310.0	9	106.8	34	340.9	8	146.6	43	10.0	8.6
Japan	JAP	329.4	9	54.3	16	360.9	9	77.2	21	9.5	4.9
Australia	AUS	100.5	3	30.7	31	117.0	3	46.5	40	16.4	9.2
China	CHI	101.6	3	25.8	25	210.1	5	54.5	26	106.8	0.5
India	IND	76.2	2			98.9	2			29.7	
WORLD		3602.6				4019.4				11.6	

The volume of international collaboration has increased significantly between 1996-'00 and 2001-'05. This trend is apparent across all countries and across all the main disciplines.

For the US, collaboration as a proportion of output increased by 5,3%, ~ 89,800 papers in absolute terms.

Germany increased its collaboration volume by about 40,000 papers on an increase of 8.6%.

Changing Volume of International Collaboration

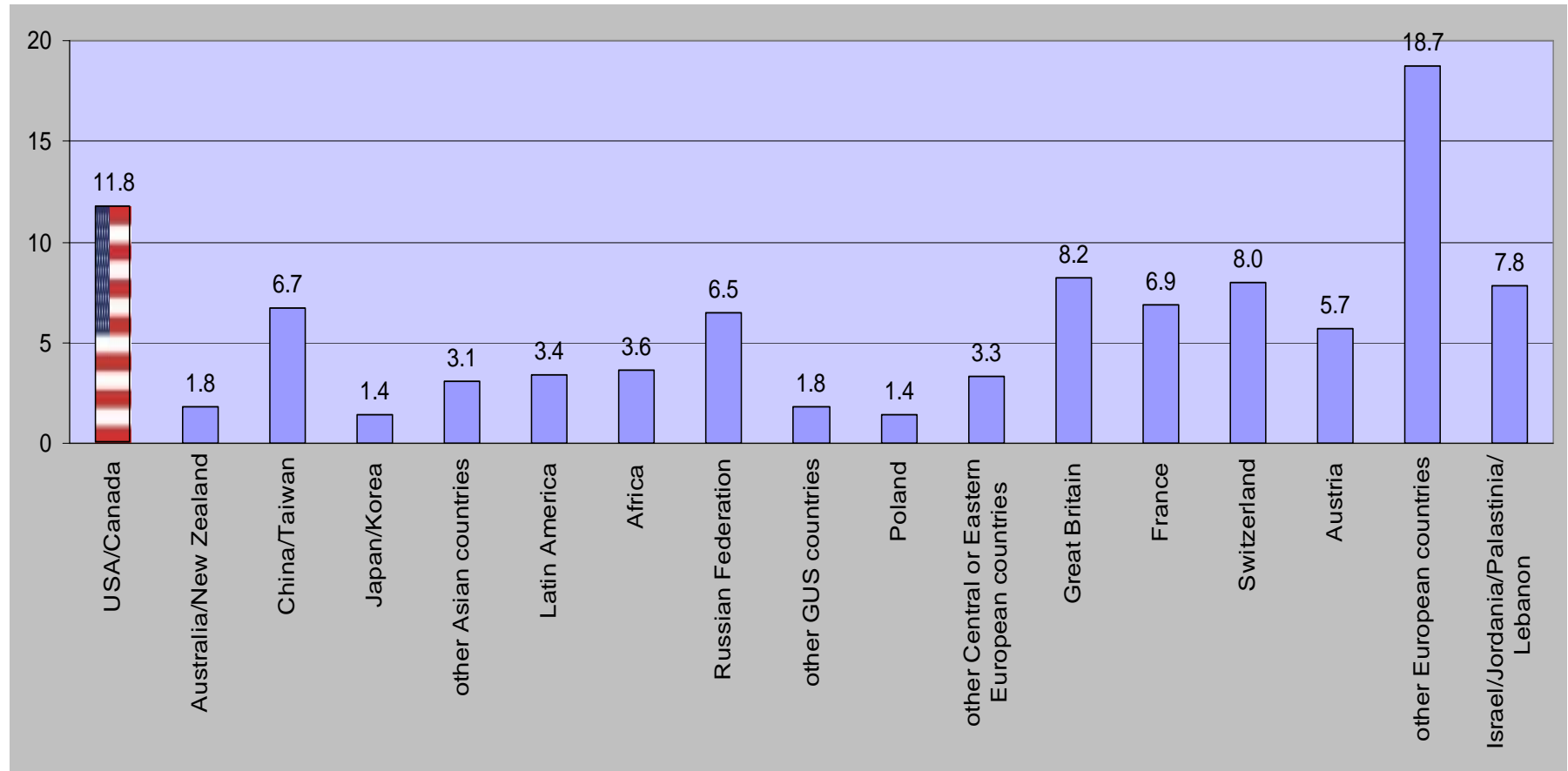
(a) Collaborative output by Country

	1996-2000										2001-2005									
	Total	UK	USA	CAN	FRA	GER	JAP	AUS	CHI	IND	Total	UK	USA	CAN	FRA	GER	JAP	AUS	CHI	
UK	97592		30874	6138	11114	13490	4988	6039	2838	1369	144457		43337	9248	15502	20235	6658	9573	5505	
USA	244911	30874		28754	20744	32095	23711	10679	9226	4555	334662	43337		38913	27135	43921	31148	15999	20542	
CANADA	55429	6138	28754		4791	4136	3069	2433	1801	627	75659	9248	38913		6423	6464	3933	3672	3688	
FRANCE	82076	11114	20744	4791		11863	3119	1772	1351	1036	107729	15502	27135	6423		16609	4646	2753	2774	
GERMANY	106821	13490	32095	4136	11863		5485	2729	2754	1713	146615	20235	43921	6464	16609		7464	4388	5401	
JAPAN	54346	4988	23711	3069	3119	5485		1986	3915	1076	77197	6658	31148	3933	4646	7464		2964	8631	
AUSTRALIA	30743	6039	10679	2433	1772	2729	1986		1463	391	46502	9573	15999	3672	2753	4388	2964		3663	
CHINA	25836	2838	9226	1801	1351	2754	3915	1463		404	54529	5505	20542	3688	2774	5401	8631	3663		

(b) Changing patterns of collaboration

	% of total Collaboration - 2001-2005								
UK		30.0	6.4	10.7	14.0	4.6	6.6	3.8	
USA	12.9		11.6	8.1	13.1	9.3	4.8	6.1	
CANADA	12.2	51.4		8.5	8.5	5.2	4.9	4.9	
FRANCE	14.4	25.2	6.0		15.4	4.3	2.6	2.6	
GERMANY	13.8	30.0	4.4	11.3		5.1	3.0	3.7	
JAPAN	8.6	40.3	5.1	6.0	9.7		3.8	11.2	
AUSTRALIA	20.6	34.4	7.9	5.9	9.4	6.4		7.9	
CHINA	10.1	37.7	6.8	5.1	9.9	15.8	6.7		
Average	13.2	35.6	6.9	8.0	11.4	7.2	4.6	5.7	
	UK	USA	CAN	FRA	GER	JAP	AUS	CHI	

Percentage of Foreign Collaboration Partners Individual Grants Program 2004 - 2006



Drivers of Internationalization

- globalization of the world economy
- increasingly international communication networks, career choices, and interpersonal interactions
- student and faculty recruitment pools as well as infrastructure and facilities increasingly outside national boundaries
- internet revolution; drastically reduced cost of communication; boost for non-physical exchanges in scientific work
- speed of science
- cost sharing
- challenges without borders: SARS, AIDS, forest fires, energy issues, pollution, global warming, species extinction, terrorism, health care, hunger ...
- complex research questions

The Tripod of Internationality



Framework conditions for international collaboration

- international peer review
- membership in international organisations / committees
- taking global responsibility
- eligibility of international scientists and researchers in all DFG funding programs on the condition that they carry out their research in Germany

DFG Abroad

Sino-German Centre
for Science Promotion
Beijing, 2000



Liaison Office
Washington, 2002
New York, 2007



Liaison Office
Moscow, 2003



Liaison Office
New Delhi, 2006



Aims:

- promoting scientific collaboration
- building an extensive network of personal and professional links
- contact for funding agencies
- organizing and conducting of bilateral symposia

DFG North America Office



- to maintain and extend **contacts** with current and former DFG award holders and alumni in the United States and Canada
- to support and expand **cooperation** with partner organizations in the USA and Canada
- to **inform** US and Canadian universities and research institutions about Germany as a location of science and research and about opportunities for research collaboration
- to follow and assess **science and research policy developments** in the United States and Canada in fields relevant to the DFG with respect to basic research



Funding for international research endeavors at a glance:



The DFG promotes...

- international project cooperation
- international mobility of scientists and researchers
- the internationalisation of German universities

The DFG is also represented as an institution in various scientific and science policy organisations and bodies at an international and a European level.

► News

- **International Funding at a Glance**
- **Forms and Guidelines on Funding for International Projects (in German)**
- **Contact**

Categories

- | | |
|--|---|
| ► Promotion of International Cooperation | ► International Promotion of Young Researchers |
| ► The DFG's Role in International Research Policy | ► International Partners and Agreements |
| ► The DFG and Europe | ► International Representation of the DFG |
| | ► FAQ (available in German only) |

International Travel

- in preparation for or within a cooperation project
- to participate in a scientific conference

Research Visits to Germany

- in preparation for or within a cooperation project
- to participate in a scientific conference (only for young German researchers working abroad)
- visiting professorships (Mercator Programme)

Events in Germany and Abroad

- bilateral events
- international seminars and specialist conferences

Within Projects

- Section Research Funding – Individual Grants Programme

Within Coordinated Programmes

- Section Research Funding – Coordinated Programmes

Literature Donations and the Digital Research Library

- project funding

Young Researchers

- international funding for young researchers

Scientific Prizes

- Copernicus Award
- Seibold Prize

DFG: International research collaboration

International modules within DFG's funding portfolio

- in all DFG-funding programs
- travel; exchange between researchers

International DFG funding programs

- International Research Training Groups
- joint solicitations with partner organisations (e.g. DFG/NSF chemistry; materials world network)

DFG funding programs for international mobility:

- bilateral collaboration (in this form new as of 1.1.2009)
- Mercator visiting professorships
- research grants for postdocs



Bilateral Cooperations: Streamlining the Funding Instrument

- merging former instruments for international collaboration into this new, flexible, modular funding instrument as of 01.01.2009
- to establish and strengthen scientific cooperations with international partners
- funding period: up to one year
- a choice of combining various modules (preparatory trips, collaborative visits, bilateral events)

for example
in one year



Preparatory / Collaborative Visits

- enable scientists to develop collaborative activities
- collaboration must relate to concrete project not just a general institute to institute collaboration
- invitation by host
- *preparatory visits*: not longer than three weeks
- *collaborative visits*: not longer than three months
- funding for travel, accommodation, and per diems



➤ http://www.dfg.de/en/international/international_cooperation/cooperation_projects/kompaktdarstellung_int_travel_research_visit.html

Bilateral Events

Aim: facilitate/ initiate international collaborative project

- granted on the basis of a proposal received from the coordinator in Germany
- co-funding from partner country expected (partner organisation or institution)
- event may be held either **in Germany** or in the **partner country**

Type and extent of funding:

- *Bilateral events in Germany:* Contribution towards travel expenses within Germany for the German participants, maintenance costs for both the German and the foreign participants, and the cost of materials required for the event
- *Bilateral events abroad:* Contribution towards international travel expenses for the German participants
- *Time to decision:* two to three months following receipt of the proposal



➤ http://www.dfg.de/en/international/international_cooperation/cooperation_projects/kompaktdarstellung_bilateral_events.html

Mercator Visiting Professorship Program

To enable German universities to invite **highly qualified** scientists and scholars from abroad

Aims:

to provide visible international quality in the host university's activities
to contribute to the internationalization of higher education and research in Germany

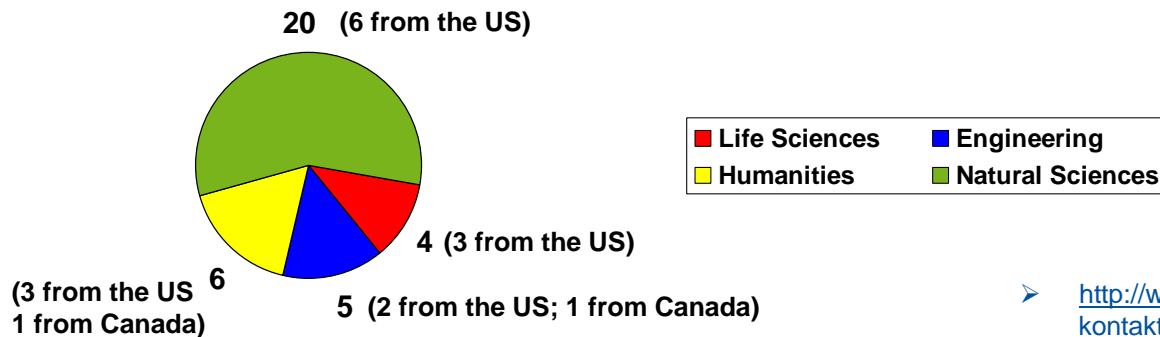
Features:

applications related to focal points in the university's scientific profile

contribution to:

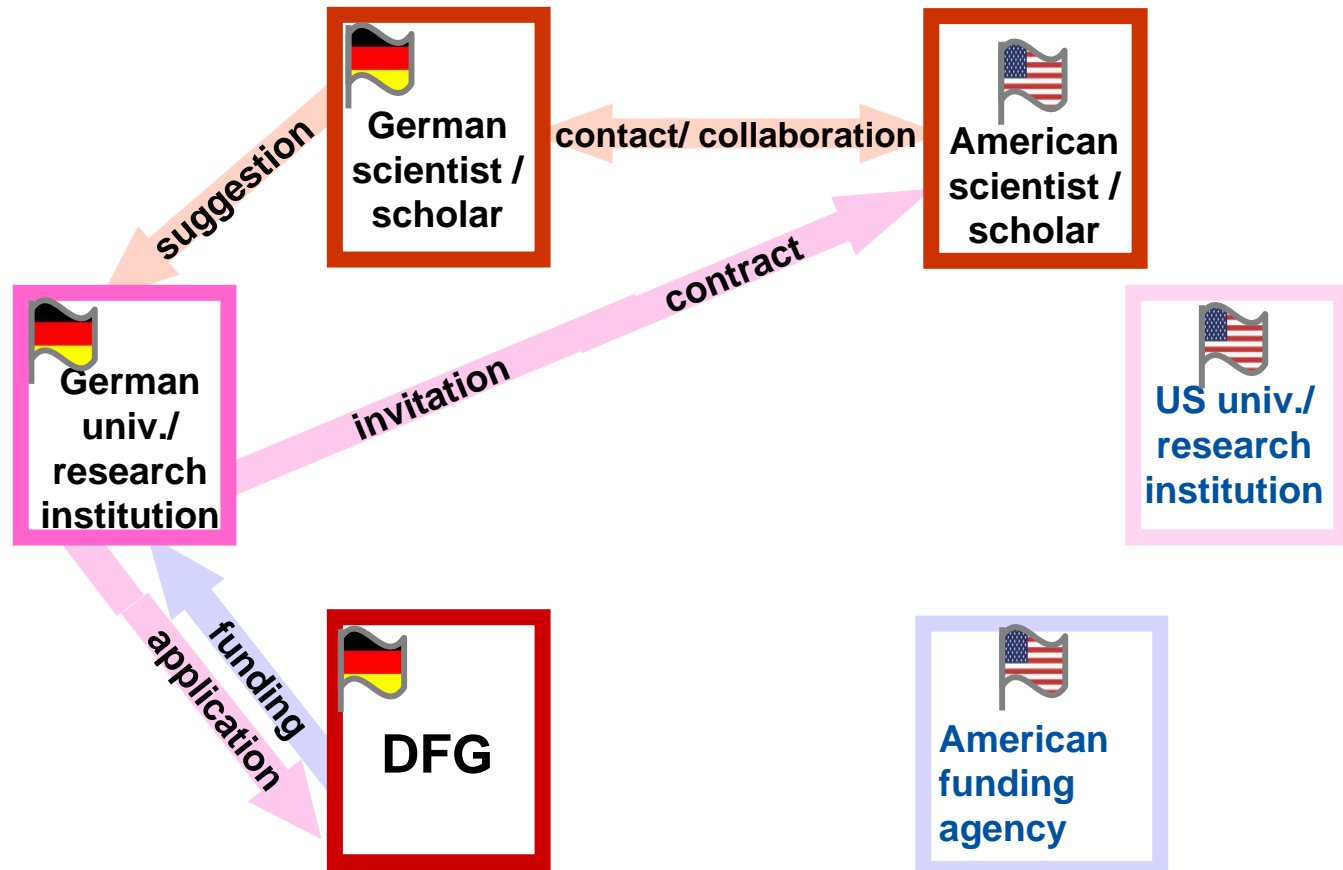
- research
- research-related educational activities
- graduate Research Training at the respective university department

intended stay: between 3 and 12 months



➤ http://www.dfg.de/forschungsfoerderung/wissenschaftliche_kontakte/mercator/

Mercator Visiting Professorship Program



What's in It for Me?

My year in Aachen (2000-01) with Professors ... was one of the best years of my life. My wife and I were treated very well and many friendships have come out of that year at RWTH. In addition, our collaborations have continued (I am presently working on a new manuscript with Professor ... who is now at ...). I have included a list of my publications starting with my year in Aachen. This association has led to 14 publications directly and 5 or 6 others indirectly. Many of these articles broke new ground in their respective areas of NMR, ionic liquids and molecular modeling. On the basis of these publications I received financial support from the Air Force Office of Scientific Research.

I can never thank RWTH and the Deutsche Forschungsgemeinschaft enough for the awarding of a Mercator Professorship. I have held a number of visiting Professorships at other places, but this was the best of all possible awards. Once again, I will always be eternally grateful for this award.

friendships; contacts

**co-authored
publications**

**groundbreaking
knowledge**

new national funding

**lasting memories;
life time experience**

What's in It for Students, Science, and Society?

"Meine Mercator-Professur in Köln in 2005 war sehr fruchtbar, sie hat zu einer intensiven Forschungszusammenarbeit geführt.

Neben einem regen Studentenaustausch (4 Doktoranden aus Köln haben das MIT für ein bis mehrwöchige Aufenthalte besucht, MIT Studenten die Uni Köln) haben wir in Köln ein wissenschaftliches Projekt gemeinsam mit dem Lehrstuhl Prof. Schoder und der Kreissparkasse Köln, dem MIT Center for Collective Intelligence, und dem MIT Media Lab durchgeführt (Social Badges). Dieses Projekt hat in der US und Deutschen Presse großes Echo gefunden, und hat zu mehr als einem Halbdutzend wissenschaftlichen Publikationen geführt. Wir haben eine permanente gemeinsame Forschungsgruppe zum Thema Social Network Analysis ins Leben gerufen. Daneben war in der Folge auch mein Gastgeber in Köln, Prof. Schoder, bereits als Visiting Scholar für ein Semester unser Gast an der MIT Sloan School of Management, einer seiner engsten wissenschaftlichen Mitarbeiter, Dr. Kai Fischbach, wird uns voraussichtlich nächstes Jahr als Visiting Scholar besuchen.

Wir werden außerdem gemeinsam nun zum vierten Mal eine Vorlesung gemeinsam mit Uni Köln, und Helsinki University of Technology durchführen, auf der international gemischte Studententeams virtuelle Zusammenarbeit und Kommunikation in COINs (Collaborative Innovation Networks) mit Hilfe der Sozialen Netzwerkanalyse lernen und erfahren. Die Vorlesung entstand während meines Mercator-Aufenthalts in Köln. Aus meiner Sicht ein rundum positives Fazit, unbedingt weiterzuempfehlen."

**intensive research
collaboration**

**lively student exchange in
both directions**

joint projects

**press coverage for the
results in the US and
Germany**

visiting professors

4th joint lecture series

**virtual student
collaboration**

DFG Research Training Groups (*Graduiertenkollegs*)

- thematically focussed interdisciplinary research and study programs at universities; maximum funding period: 9 years
- 5-12 faculty; 1-2 postdocs, 1 coordinator; 12-24 PhD students; selected undergrads
- established at scientific centres of excellence
- mobility period at universities abroad; conferences; summer schools
- regular supervision of PhD students; mentoring programme
- tailor-made study programme; large scope for students initiatives
- three-year stipends for doctoral students, open internationally
- currently ca. 235 RTGs funded: www.dfg.de/gk/en/



The International Dimension of Research Training Groups

International students are welcome to apply for fellowships:

- ca. 30% international PhD students
- over 40% international postdocs

Some RTGs offer their programs in English

International guest scientists

Support for international exchange of senior and junior scientists



Program variant: International Research Training Groups

- *Joint international* research training at centers of excellence
- *Jointly proposed* by a research group at a German university *and* a partner group at a university abroad
- *Joint* research and study programme
- *Joint* supervision



International Research Training Groups

bilateral:

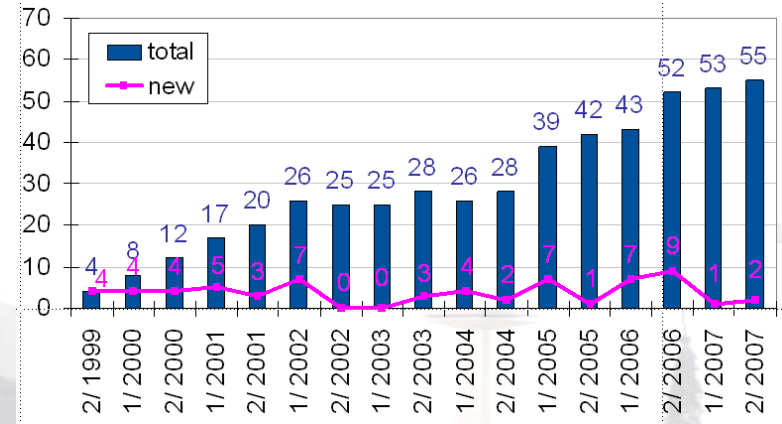
Netherlands	9
France	8
USA	5
China	6
Switzerland	4
Sweden	3
UK	2
Poland	2
Denmark	2
Japan	2
Italy	1
Norway	1
Hungary	1
Korea	1
Russia	1

trilateral:

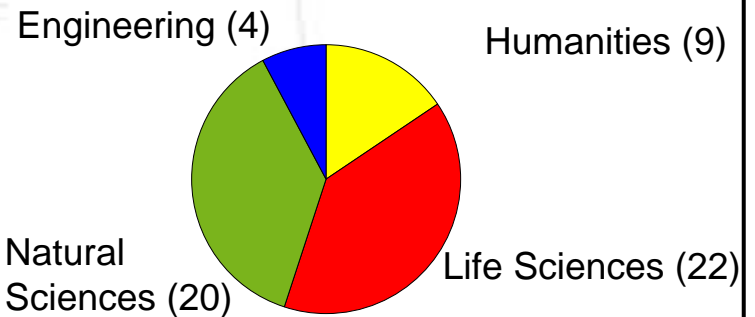
France / UK	1
UK / Belgium	1
Italy / Austria	1
France / Luxemburg	1
Switzerland / Austria	1
Japan / USA	1

quadrilateral:

Denmark / Finland / Italy	1
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Approvals by Scientific Disciplines



German-American Collaboration in Graduate Education

5 International Research Training Groups (ITRG)

- History and Culture of the Metropolis in the 20th Century (*Columbia University / New York University / Technical University, Humboldt University, Free University, Berlin*)
- Visualization of Large and Unstructured Data Sets – Applications in Geospatial Planning, Modeling and Engineering (*University of California, Davis / TU Kaiserslautern*)
- Signaling Mechanisms in Lung Physiology and Disease (*Albert Einstein Hospital New York / Columbia University College of Physicians and Surgeons, New York / Justus-Liebig University Giessen*)
- Brain-behavior Relationship of Normal and Disturbed Emotions in Schizophrenia and Autism (*University of Pennsylvania, Philadelphia / RWTH Aachen*)
- Brain signaling: from neurons to circuits (*Georgetown University, Washington, DC, TU Munich*)

1 ITRG in cooperation with IGERT:

- Perspectives on Urban Ecology (*HU Berlin*) – Urban Ecology IGERT-Project (*University of Washington, Seattle*)

1 trilateral ITRG

- Genomics and Systems Biology of Molecular Networks (*Humboldt University Berlin, Free University Berlin, Boston University, and Kyoto University*)



Transatlantic Research Training Group 1131:

Visualization of Large and Unstructured Data Sets –
Applications in Geospatial Planning, Modeling and Engineering; <http://www.irtg.uni-kl.de/>

UCL Davis



University of Kaiserslautern

Program of study and tuition:

- **co-advising**
- **co-teaching** (joint seminars at both locations)
- an obligatory **stay abroad** at the partner university
- **lecture series** and project-oriented doctoral **colloquia**, annual **conferences** and regular **workshops** as well as events organized by the scholars themselves

acatech: 09/2008 Recommendations on PhD Studies in Engineering

1. independent research achievement
2. acquisition of soft skills
3. eligibility to PhD studies
4. selection of doctoral students according to criteria of excellence
5. structure of PhD
6. memorandum of understanding between supervisor and PhD candidate
7. length of doctoral phase
8. contribution to teaching
9. relation to industry
10. internationalisation
11. specific promotion of female PhD candidates
12. degree nomenclature

acatech: 09/2008 Report

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Science is increasingly moving towards international issues and is, more than ever, internationally inter-linked.

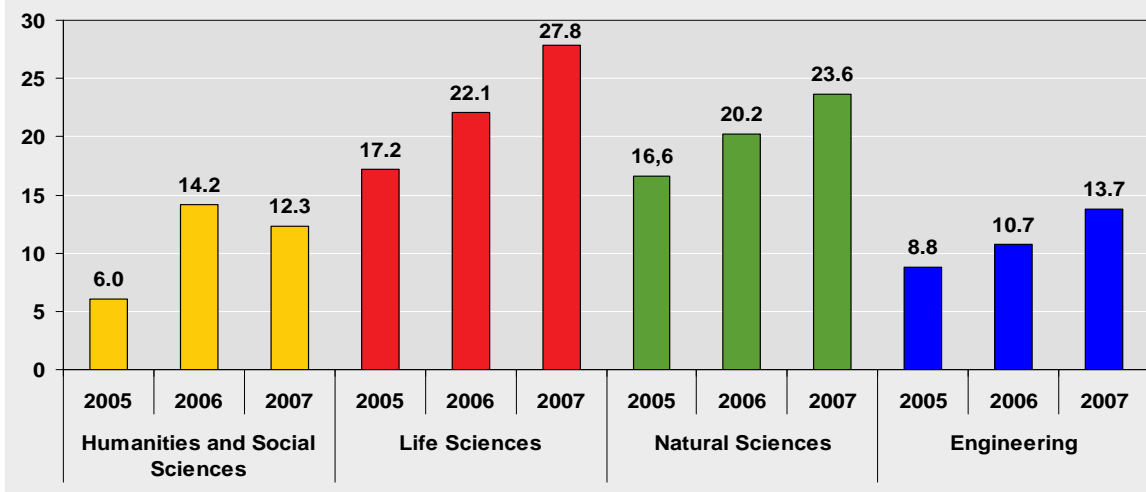
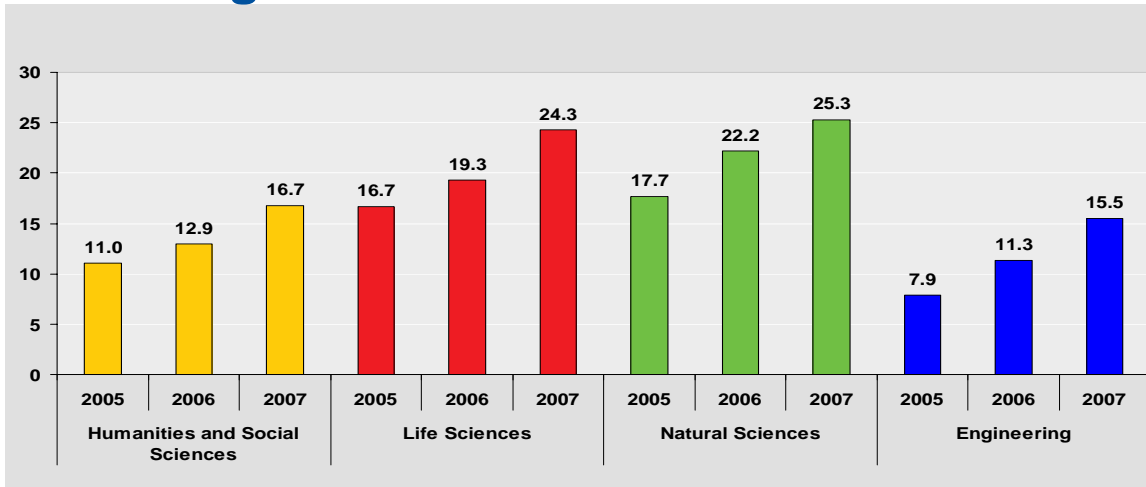
This is true for research in the field of engineering as well
....

An engineering doctorate has to take into account **the rising importance of international experience** – concerning research topics, future employment opportunities abroad or acquiring multilingual skills.

Elements of internationalizing a PhD student's skills are publications in international journals, active participation in international conferences and working on international projects.

If at all possible, a PhD student should aim at some three months abroad

Percentage of Reviewers from Abroad Increasing



total

and
thereof:

percentage of
reviewers from
North America

The German "Excellence Initiative"



Joint funding by the government (75%) and the federal states (25%)



sum total (2006-2011): 1.9 billion €; 380 million € p/a

20% of the project grant sum for indirect costs of research

Overall Strategy for Top-Level University Research

Graduate Schools

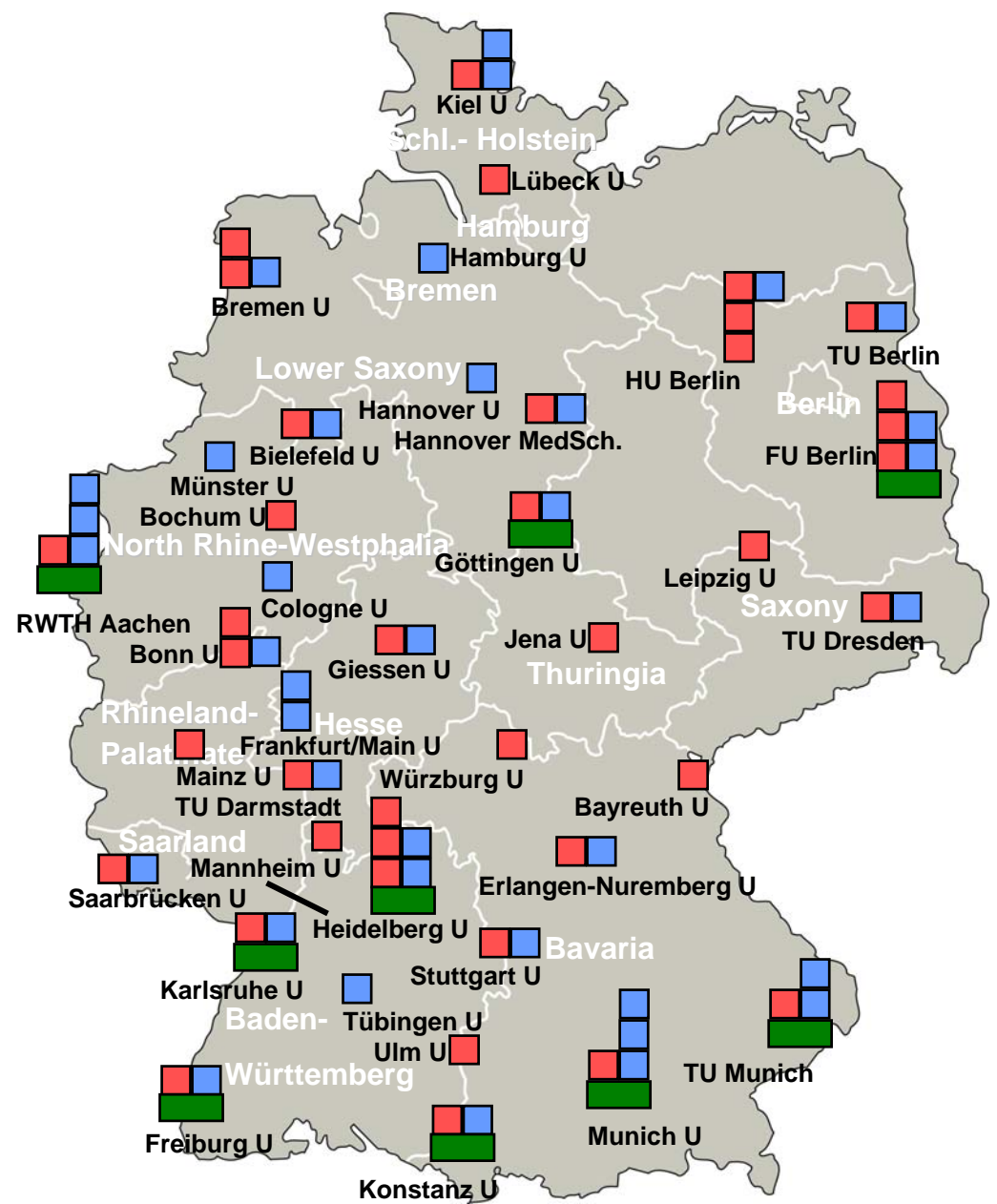
approx. 1 million € p/a each

Clusters of Excellence

approx. 6,5 million € p/a each

Germany after the "Excellence Initiative"

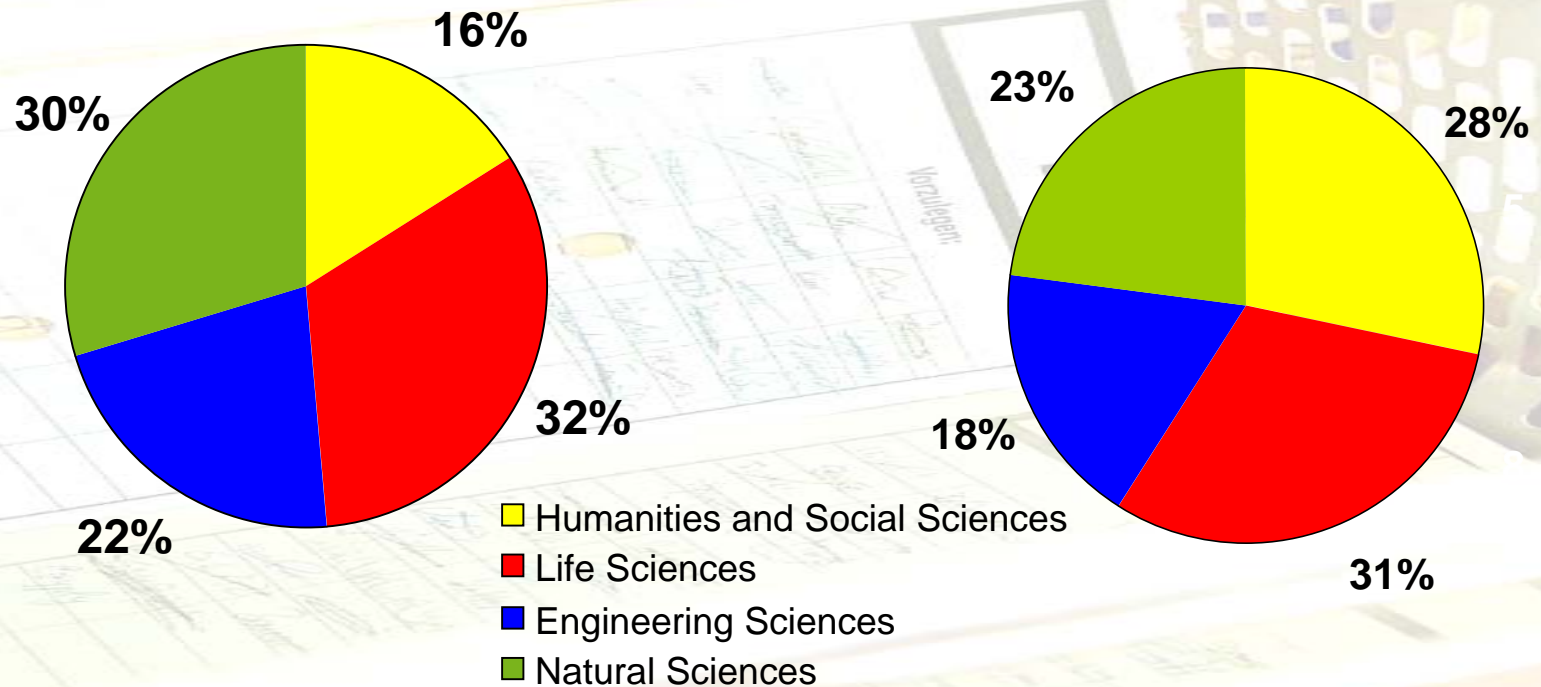
-  Graduate Schools
-  Clusters of Excellence
-  Institutional Strategies



Excellence Initiative: Proposals Funded According to Disciplines

Clusters of Excellence (37)

Graduate Schools (39)



Excellence Initiative: Engineering Sciences / Clusters of Excellence



RWTH Aachen	Ultra High Speed Mobile Information and Communication
RWTH Aachen	Integrative Production Technology for High-Speed Countries
RWTH Aachen	Tailor-Made Fuels from Biomass
U Bielefeld	Cognitive Interaction Technology
U Erlangen	Engineering of Advanced Materials – Hierarchical Structure Formation for Functional Devices TU Munich Cognition for Technical Systems
U Saarbrücken	Multimodal Computing and Interaction. Robust, Efficient and Intelligent Processing of Text, Speech, Visual Data and High Dimensional Representations
U Stuttgart	Simulation Technology

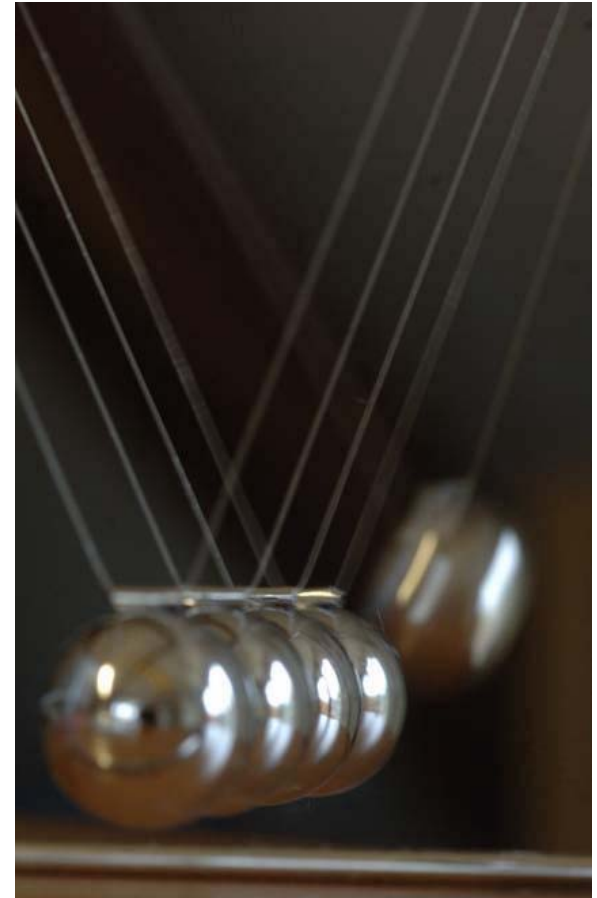
Excellence Initiative: Engineering Sciences / Graduate Schools



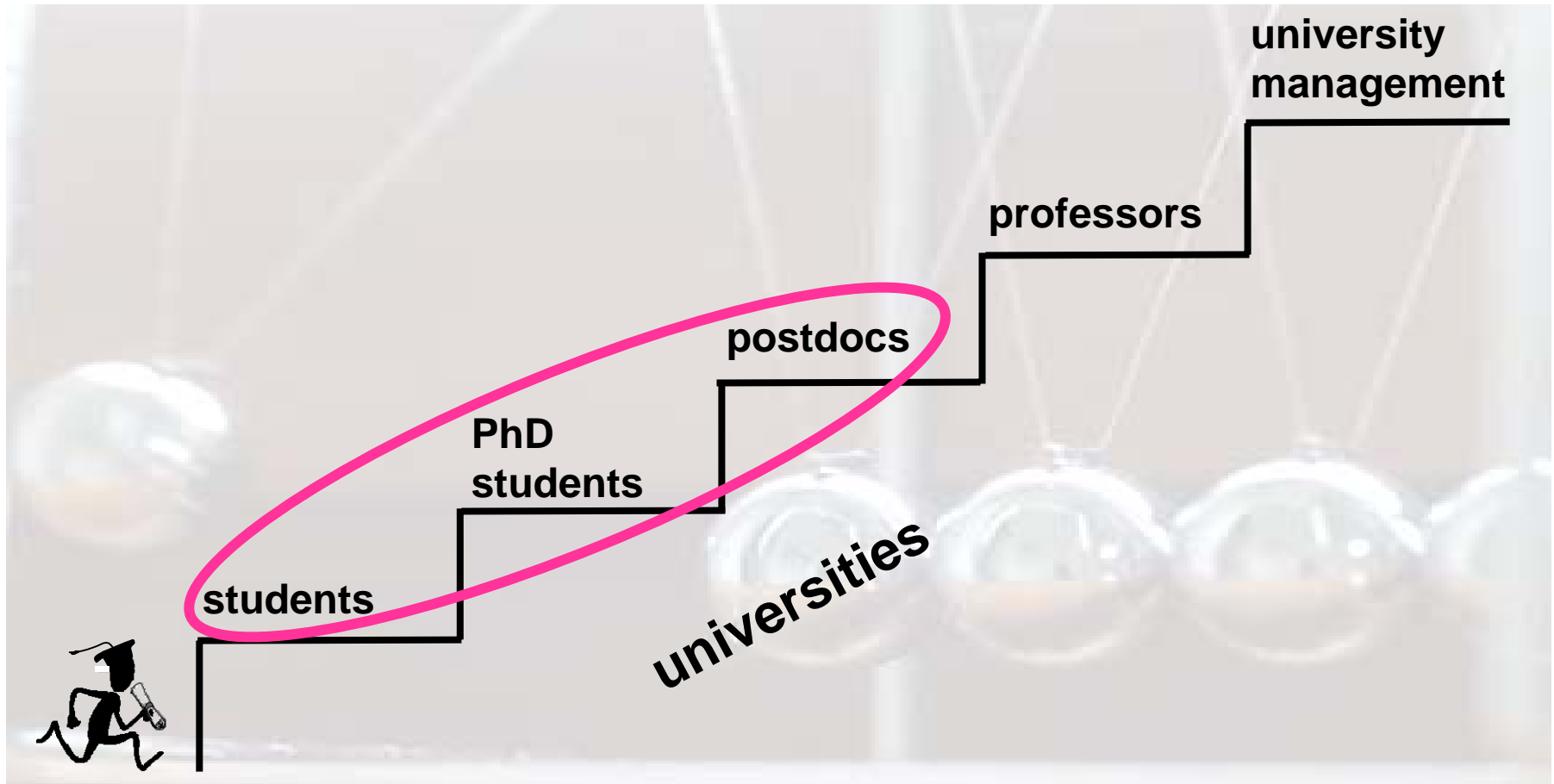
RWTH Aachen	Aachen Institute for Advanced Studies in Computational Engineering Science
U Darmstadt	Graduate School of Computational Engineering
U Erlangen	Erlangen Graduate School in Advanced Optical Technologies
U Lübeck	Graduate School Information Technology in Medicine and the Life Sciences
TU München	International Graduate School of Science and Engineering
U Saarbrücken	Graduate School of Computer Science
U Stuttgart	Graduate School for Advanced Manufacturing Engineering

The Excellence Initiative's Impact on German Universities

- **creativity boost** for the university system
- "The powers of introspection and self-criticism are strengthened, the **competition between universities** gains momentum"
- **structural changes**
improved communication among researchers → new cooperation projects and ideas for performance based research funding within the university → more flexible ways of responding to specific requirements of excellent research areas
- impulses towards greater
 - **internationalization**
 - **gender balance**
 - **diversity**
- **Increased awareness** for universities/ university research in the **media** and the general public
- **alumni culture**
- **fundraising strategies**

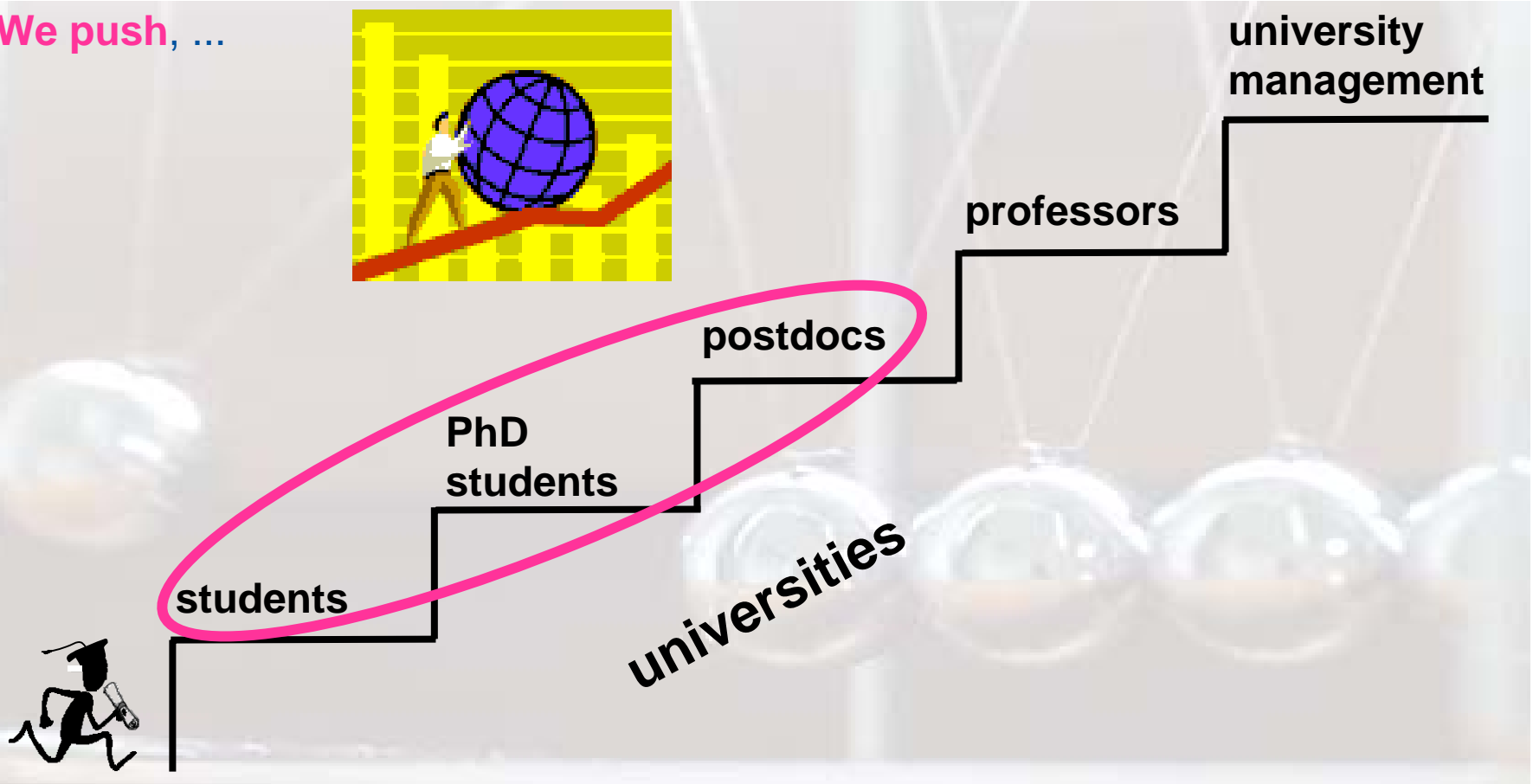
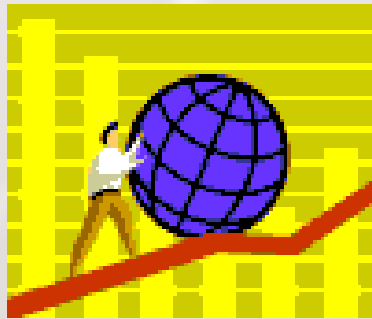


People



People

We push, ...



Foreign Students in Germany / German Students Abroad

Participation of Foreign Students in Tertiary Education:

	Total	
	Number	% of Students
US	586,316	3.5
UK	255,233	11.2
DE	240,619	10.7

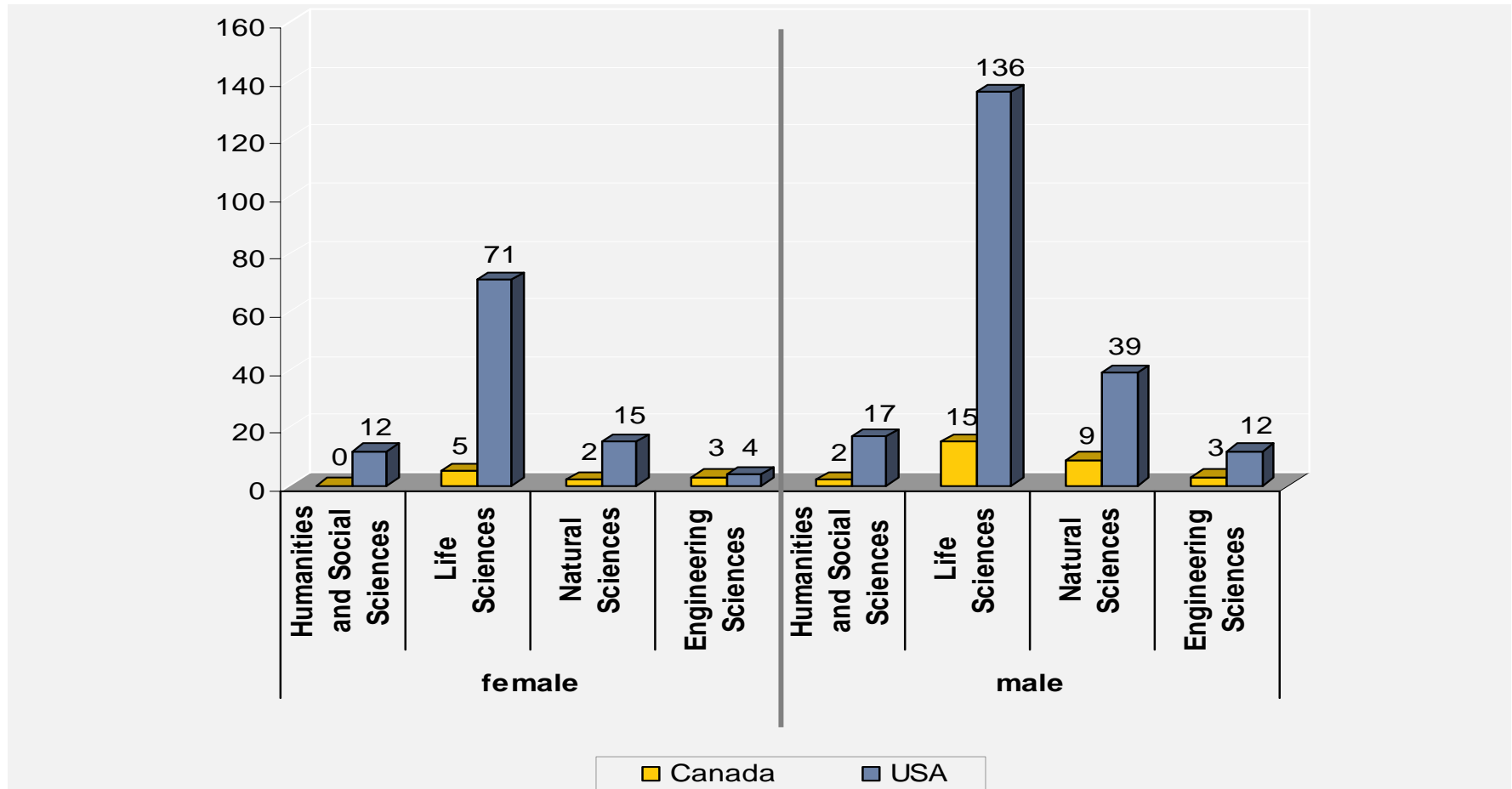
In 2003 the number of foreign students at German institutions of higher education was more than nine times as high as it was in 1970.

German students' academic experience abroad:

An estimated 33% of German students have studied abroad sometime during their career.
Goal: 50% in 2012

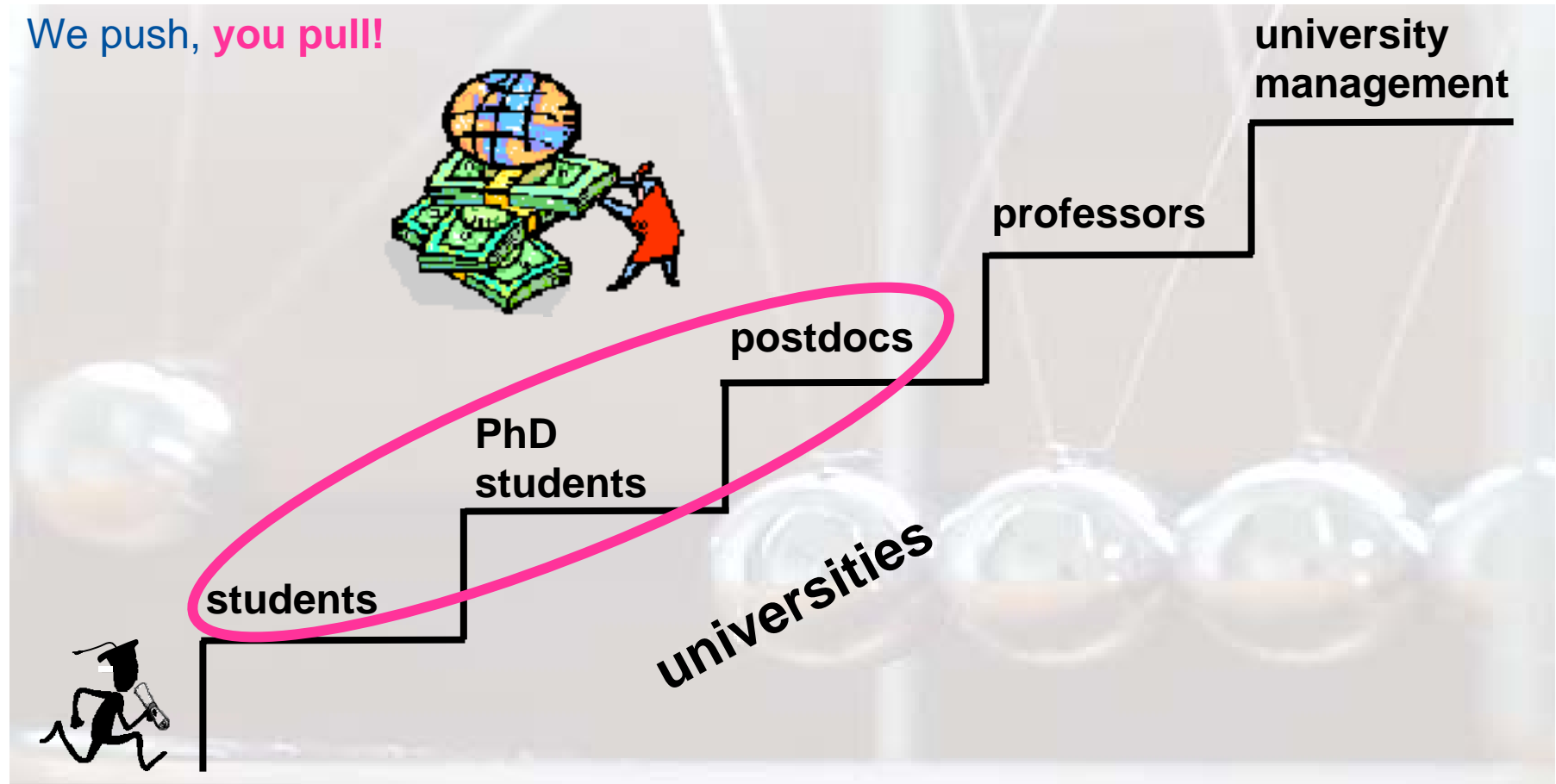
17% of German doctoral students went abroad in 2005.

DFG Postdoctoral Fellowship Holders Funded in Canada and the US by Scientific Field 2007

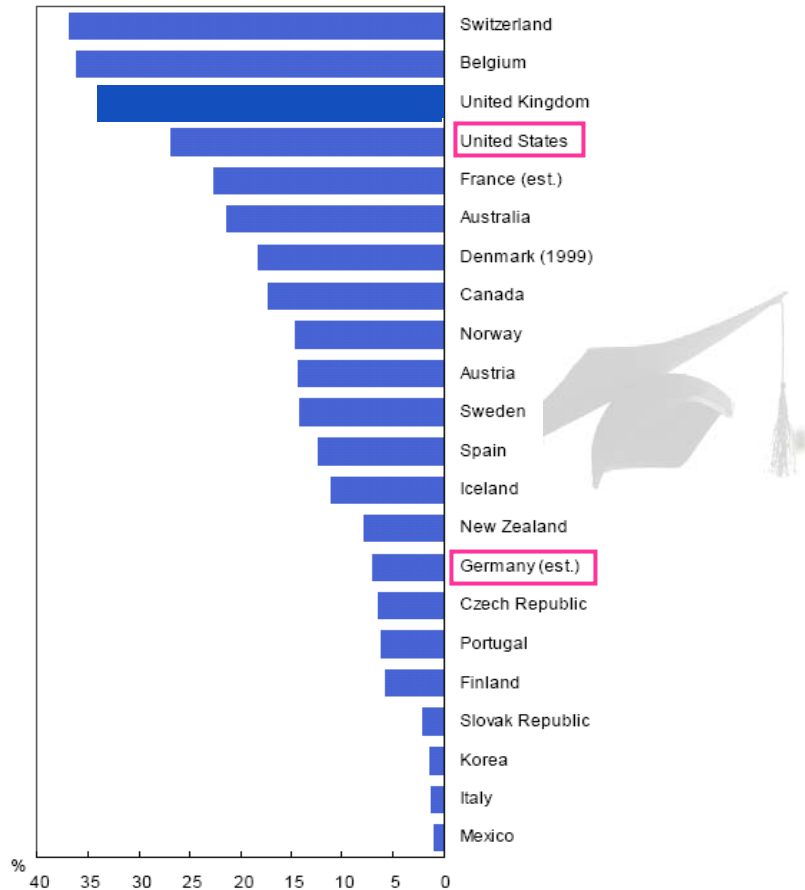


People

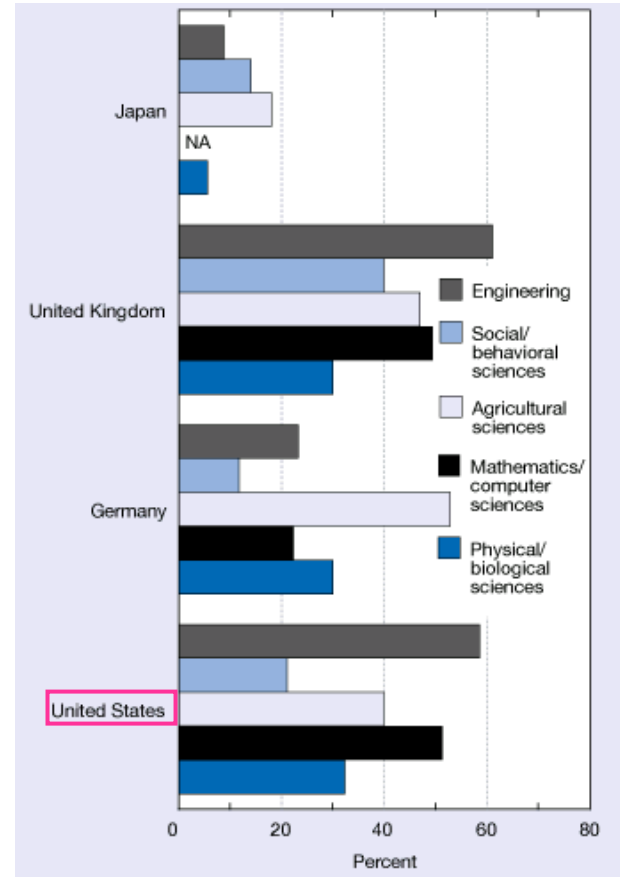
We push, **you pull!**



Foreign PhD Students, 2001



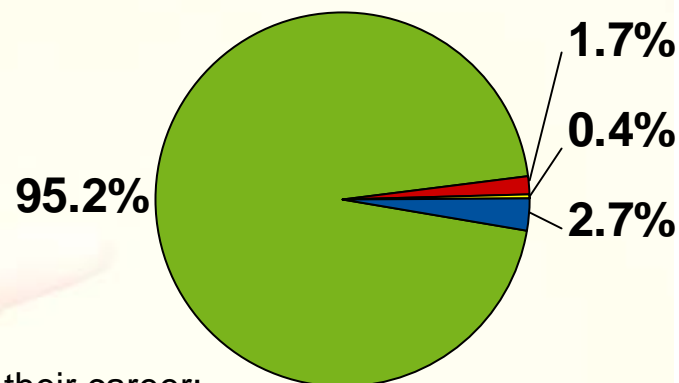
S&E Doctoral Degrees Earned by Foreign Students, by Field



US Students Abroad 2005: 206,000 (out of 1.34 Million BA's awarded)

95.2%; 196,112
1.7%; 3,502
0.4%; 824
2.7%; 5,562

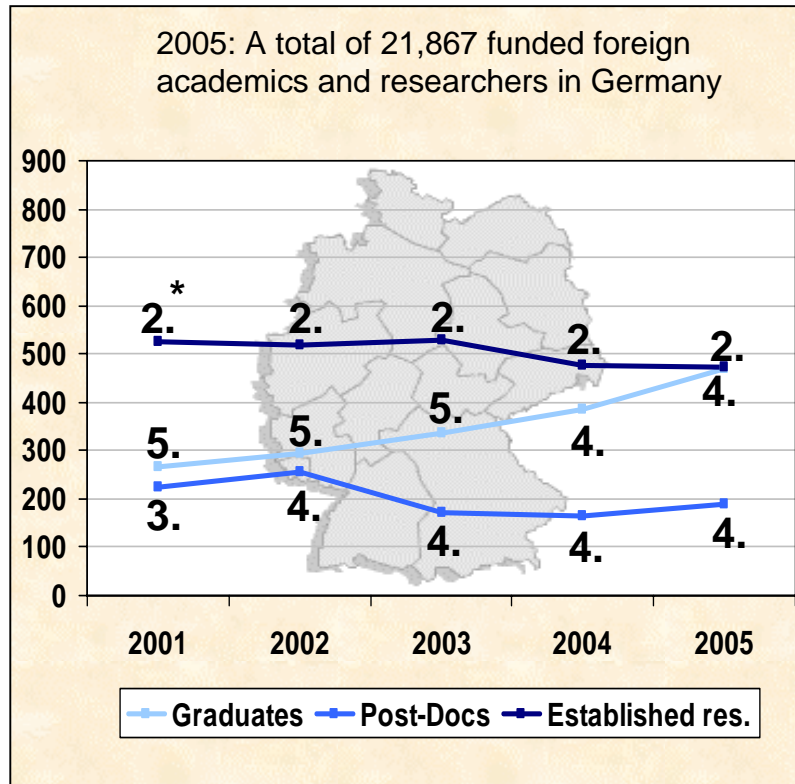
■ Undergraduates
■ Graduates
■ Doctoral Students
■ Community College



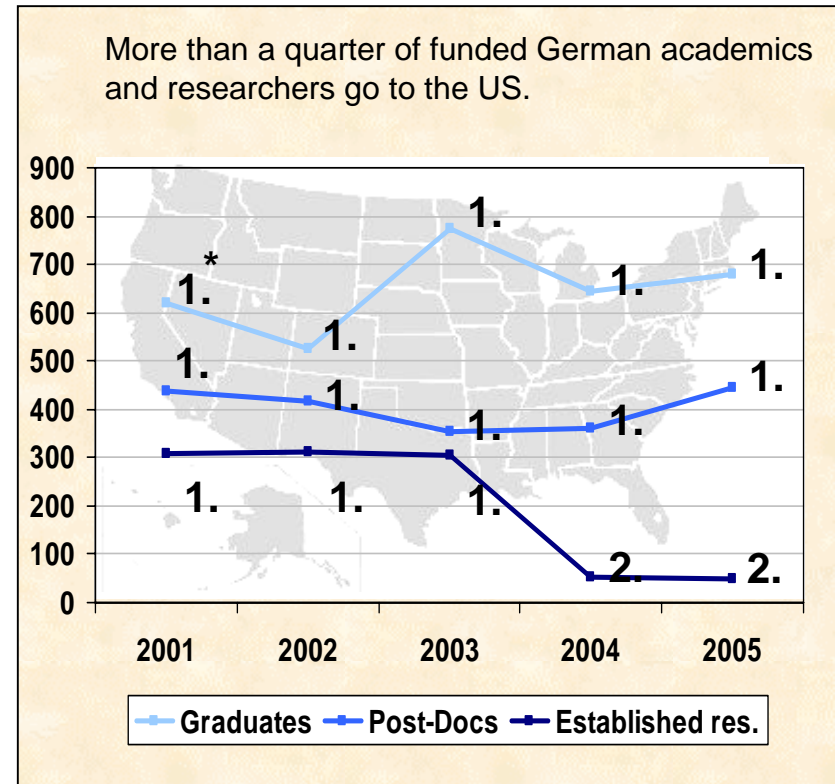
- 15% of US students have studied abroad sometime during their career; an estimated 7%: for a semester or more (which could be considered as matriculated)
- An estimated 33% of German students have studied abroad; 15% matriculated
- Doctoral degrees awarded 2005: 46,000 → 1,8% of US doctoral students went abroad in 2005
- Germany: 2,978 funded German doctoral students went abroad, in 2005; 17,000 Doctoral degrees awarded in Germany in 2005:
→ 17% of German doctoral students went abroad in 2005

**International mobility of US undergraduate students is half that of German students'.
International mobility of US doctoral students is 11% that of German doctoral students.**

US Researchers in Germany (with funding)



German Researchers in the US (with funding)

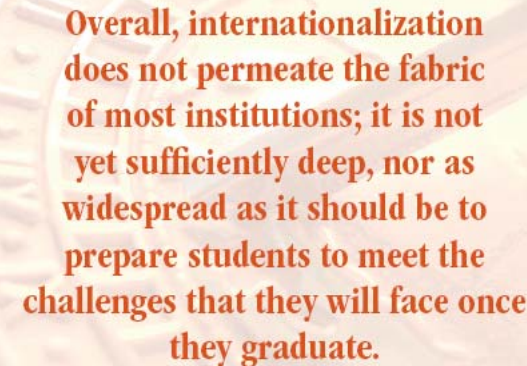


*: position among all countries

Mapping Internationalization on US Campuses: 2008

Key findings:

- internationalization: not a high priority on most college campuses. Many institutions: internationalization not integral to identity or strategy
- less than 40%: specific reference to international or global education in mission statements
- only 23%: separate plan for institution-wide internationalization
- 37% of colleges and universities require a course with an international or global focus as part of the general education curriculum (41% in 2001)
- fewer than one in five: foreign-language requirement for all undergrads
- majority of institutions: no full-time person to oversee or coordinate internationalization
- 91% of institutions offer study abroad opportunities; about 31% offer internships abroad. BUT: student participation remains low
- 27% of institutions reported that no students graduating in 2005 studied abroad

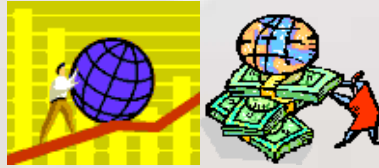


Overall, internationalization does not permeate the fabric of most institutions; it is not yet sufficiently deep, nor as widespread as it should be to prepare students to meet the challenges that they will face once they graduate.

—From the Executive Summary

People

We push, you pull!



International research collaboration
needs both.



students

PhD
students

postdocs

professors

university
management

universities

- 
1. Introduction: Facts & Figures about DFG
 2. Meeting the challenge of interdisciplinarity
 3. Internationalisation – why and how?
 4. **Points for Discussion**


Points for Discussion

- The number of US citizens in engineering graduate programs has declined consistently over the years, while the number of foreign citizens has grown – why?
- Why is the share of international students in engineering programs very low on the undergraduate level (only 8% of all students compared to 20% in the UK)?
- What accounts for the growing importance of post-doctoral fellowships (22% of the engineering graduates had a definite plan for post-doctoral studies (= twice as many as 20 years ago)?
- Why don't American PIs encourage their postdocs to spend an extensive amount of time abroad? Why is time spent abroad seen more as a stumbling block than a stepping stone?
- International research collaboration as a nucleus for a two-way mobility on all career levels?

Deutsche
Forschungsgemeinschaft

Thank you very much for your
attention!

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