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Strategies to Win the Best: German Approaches in International Perspective

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Strategies to Win the Best
German Approaches in International Perspective

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Preface

With the globalization of science and research, especially as accelerated since the fall of the Iron Curtain, the demand for expertise on issues relating to the internationalization of science and scholarship has increased – not only, but certainly for the Alexander von Humboldt Foundation. Established by the Federal Republic of Germany, the Humboldt Foundation has been actively engaged in the promotion of international research cooperation for more than fifty years. It enables excellent international researchers to spend extended periods of research time in Germany and helps to maintain the ensuing academic contacts. With increased competition for excellent scientists and scholars from around the world, the Humboldt Foundation has assumed an active role in German policy debates in the past years, joining forces with its partners to ensure that Germany remains a top address for the international academic elite.

The International Advisory Board of the Alexander von Humboldt Foundation was established in 2007 to assist in this effort. It addresses current developments in global academic markets and identifies topics of special strategic concern to the Foundation and its partners in Germany, the United States, and beyond. As an independent expert group, the eminent members of this body meet once a year to advise the Foundation and its partner organizations on issues relating to the global mobility of researchers and the internationalization of research, thereby supporting the Foundation's strategic planning. With the establishment of the annual forum on the Internationalization of Sciences and Humanities, the Board has provided a public forum for debate on global developments in science and academia and on matters of science policy that impact on international initiatives. The Forum's proceedings and the Board's recommendations are published annually for the benefit of a wider audience.



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This volume presents the proceedings of the second Forum on the Internationalization of Sciences and Humanities, which took place on 6 December 2008 at the Berlin-Brandenburg Academy of Sciences and Humanities in Berlin. The Forum took a comparative approach to current reform initiatives in Germany, using Germany as a lens to discuss how nation states can raise the attractiveness of their research systems

and draw international expertise into the country. Founded by the great polymath Gottfried Wilhelm Leibniz, the former Prussian Academy of Sciences has been a place for international scientific exchange and home to an international association of eminent scholars for more than 300 years: an ideal location for members of the International Advisory Board, speakers, and invited guests to discuss what is needed to make Germany internationally more attractive to excellent researchers, and to explore the wide range of factors involved in winning the world's most accomplished and promising minds, in other words: the "Leibniz'es" and the "Humboldts" of our times.

We hope that you will learn much and enjoy reading.

Kenneth Preuss Helmut Schwarz

Strategies to win the best: German approaches in international perspective



The globalization of science and research since the fall of the Iron Curtain has taken many different forms. One of these relates to the exchange of views between individual researchers and to the forms of communication within the international academic community. While communication via e-mail has outdone fax machines and old-fashioned letters, having become the most frequently used way to exchange information, members of an even younger generation are very often "bloggers." The term relates to the action of "blogging" which in turn is a term that derives from the noun "blog". A "blog," a contraction of the term "web log," is a web site with regular entries of commentaries or news on a particular subject, descriptions of events or material of various sorts. Some of you might already have come across different "blogs". Today I would like to draw your attention to a blog called Gobbledygook, maintained by the Nature Publishing Group which is also the publisher of the well-known science magazine "nature." In the aftermath of this year's GAIN conference in Boston, organized by the German Academic International Network, a joint initiative of the major German research funding organizations, this blog took up the question: "How to lure (German) researchers back to Germany?" Bloggers have posted their comments, and I would like to present three as examples:

Mark Tummers: "My main reason not to return to my home country after my PhD is mainly because I don't know anyone there."

The first one is from Mark Tummers, a young Dutchman, who did a Masters in Utrecht, a PhD in Finland, and a short postdoc at the University of Florida, and now lives in Finland again. He writes about his home country, the Netherlands: "My main reason not to return to my home country after my PhD is mainly because I don't know anyone there. I did my PhD abroad. I did apply for a few positions in the Netherlands but I never even got invited for an interview. Although I fulfilled all the criteria perfectly for some. Yet they managed to find many other better qualified people." Even though Finland "is pretty much off the chart" for researchers, he says, "for such a small nation Finland pumps quite a lot of money and effort into science" and would most probably have a "science future," even though, as an-



From the left: **Georg Schütte** is Secretary General; **Rainer Grühlich** is Program Director for Strategic Planning and External Relations at the Alexander von Humboldt Foundation.

other blogger added: "for a large percentage of permanent jobs in Finnish academia you know who's going to get it before it is even announced."

Martin Fenner: "Few people go to work in a different country simply as a career choice. There are usually personal reasons involved."

The second blog entry is from Martin Fenner, a German who did his postdoc in Boston and writes: "I did a postdoc in Boston for 4 years. I was considering to stay in the US, but personal reasons tipped the balance to return to Germany. At that time there was no 'GAIN' and I wasn't really well-prepared for the return. One example would be that, in contrast to the US, it is still uncommon in Germany to get help finding a position for husband and wife if both are doing research." He continues: "Few people go to work in a different country simply as a career choice. There are usually personal reasons involved."

The last blog entry is from Heather Etchevers, a young American researcher who, just as her German "co-blogger," moved to France for "purely non-scientific

Heather Etchevers: "Germany needs to decide what the work of its researchers is worth to its self-esteem or its economy, and offer more than words and 'prestige' as compensation."

reasons." For her, the way to lure researchers back to their home country "is by making offers that cannot be made elsewhere. If France would just up the salaries a wee bit, and perhaps propose a few more positions or alternative long-term contracts, I am sure they could get many more of their bright young stars to come home....Everyone wants to be compensated for their work. Germany (and France) needs to decide what the work of its researchers is worth to their self-esteem or their economy, and offer more than words and 'prestige' as compensation....The benefits don't just need to be the money, but they do need to offset the perceived difficulties of being an expatriate. I know a couple of women researchers who settled in France because the tradeoff salary-wise was in exchange for much better social support for working women with children. And for returning nationals, those benefits need to outweigh the corresponding benefits that foreign countries offer. Bringing your kids up in your native language might not suffice."

These three blog entries illustrate the challenges and difficulties young researchers still face in an age marked by a generally increasing rate of international academic mobility. Whether it is the mere number of positions open at a given time or the challenge of being at the right place at the right moment, whether it is the problem of finding employment for the researcher's husband or wife, or the lack of social and

What is needed to make a country such as Germany internationally more attractive to cutting-edge researchers?

administrative support for researchers' families when re-settling – all these issues touch upon the very question the second Forum on the Internationalization of Sciences and Humanities shall address: What is needed to make a country such as Germany internationally more attractive to cutting-edge researchers? While for many Germans terms such as "brain drain" and "brain gain" – English terms that have meanwhile been adopted into German language – for a long time referred to neurobiology, in the past few years there has been an intense debate on the question which strategies need to be employed to win the world's brightest minds. In the following, providing questions rather than answers, I would like to introduce you to this debate by presenting some data and a few facts on the international responsiveness of the German higher education and research system: data and facts that also relate to the international mobility of researchers. Secondly, I would like to make a few remarks on recommendations issued to attract international researchers and on the steps undertaken in Germany and by the Alexander von Humboldt Foundation in particular. Finally, I would like to open the discussion to comparative perspectives on current German reform initiatives and introduce you to the structure of this year's Forum.

Principles and patterns of international academic mobility

Addressing issues of international academic mobility, both incoming and outgoing, it is necessary to differentiate between the global mobility of students and that of experienced researchers. Both follow, to make it short, two different principles: While younger students frequently follow the footsteps of their academic teachers and also put factors such as tuition costs, compatibility of university systems, program flexibility, and transparency as well as various non-academic factors such as language and culture into consideration when deciding to spend a year abroad, these so-called footstep dynamics give way to a principle described as agglomeration dynamics in the case of the mobility of more experienced researchers. Excellent researchers follow the stars of their respective academic disciplines, and these in

turn are interested in winning the most promising post-docs for their research groups. Attractive working conditions and a long-term perspective to stay in a country are crucial issues for international mobile researchers. An article entitled "Exodus-Dossier" published by the Frankfurter Allgemeine Zeitung in 2005 may illustrate just how crucial these issues may be in the future (Schwägerl 2005). It reported that strategic analysts at the National Intelligence Council, the think tank of American intelligence services, thought it possible that migration flows of students and cutting-edge researchers from America and Europe might soon be directed towards Asia. In fact, Indian and Chinese investments in nano-, bio- and information technologies are immense. By 2020, both countries could emerge as world-leading nations in technology, hurting America in some areas, yet being mostly to the disadvantage of Europe. While the scenario might appear overdramatized, it is an undeniable fact that Europe in general and Germany in particular face an even stiffer global competition for academic talent. While it is not India and China, but still the U.S. that attracts most German researchers, numbers of international student mobility and student migration patterns might provide a hint on future flows of academic talent and opportunity.

While in 1975, 0.61 million students were enrolled outside their country of citizenship, there were 2.73 million 30 years later – a more than fourfold increase; and by 2025 the number is supposed to reach 7.2 million with most of them being from China (Böhm 2002, p. 3).

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According to a study funded by the German Academic Exchange Service, a quarter of all German students and 29% of all university students have spent some study-related time abroad (DAAD 2007, p. 15), and Germany itself is among the top five countries that attract 80% of all internationally mobile students – outdone, of course, by the U.S. (34%) and Great Britain (16%), followed by France (11%) and Australia (8%). Not least due to active student recruitment

policies employed by Australia and some European countries, the American share of international student enrollments dropped from 40% in 1990 to 32% in 2000. For a while, especially in the aftermath of the September 11, 2001 attacks, the U.S. saw a quite dramatic decline in international enrollments. According to a report by the Council of Graduate Schools, the number of international graduate student enrollments dropped by 19% in life sciences and by 17% in physics and geo sciences. Recent data suggest that U.S. institutions of higher learning are catching up again, yet meanwhile active marketing policies of countries such as Australia, New Zealand, South Africa and even the Russian Federation have led to high degrees of internationalization. At the same time, the demand of students from China and India for international academic programs continues to increase. In fact, the largest group of international students enrolled in countries different of their citizenship – about 50% – is represented by Asian students. As of 2006, China, India and the Russian Federation already head the field of countries where international students studying in Germany originate from (Table 1).

Table 1: Foreign academics and researchers in Germany in 2006: the 10 most important countries of origin by quantity Source: DAAD ed. (2008)

Country of origin	Number	2005 = 100	in % *
Russian Federation	2,596	107.5	11.3
China	1,678	109.3	7.3
India	1,283	111.3	5.6
USA	1,259	104.7	5.5
Poland	772	99.0	3.4
Italy	512	111.3	2.2
Ukraine	506	111.9	2.2
France	486	87.1	2.1
Brazil	475	105.8	2.1
Spain	410	109.9	1.8

*of all funded recipients

Yet order of magnitude still is important. While there has been an increase in the number of foreign doctoral students in a number of OECD countries, the increase was especially high in the U.S., in particular in fields such as mathematics, computer science, and engineering. Stay rates shedding light on the benefits of doctoral training provided to foreign students show that more than 70% of foreign students who received science and engineering doctorates stayed in America even after receiving their PhD, with numbers being particularly high for students from China and India. According to Australian data estimates, the demand of international study programs by Asian students will rise by 27% to 70% in 2025 (Böhm et al. 2002).

In contrast to data on student mobility, the empirical base with regard to researcher mobility on an international level is rather weak. Since the end of the Cold War, however, we can observe international academic careers and career patterns that roughly fall into three categories: Firstly, there is a small number of researchers who are the international stars in their respective fields; secondly, there is the majority of researchers who seek cross-border experience to advance their positions at home, but who primarily pursue national career paths; and thirdly, there is a group of researchers which has to go abroad to find job opportunities in the first place. The last group has been made up for quite some time of researchers from Eastern Europe and the former Soviet countries. Later on, Maciej Zylicz, President of the Foundation for Polish Science, will shed more light on the situation in Poland and also explain in greater detail what has changed there since the 1990s. The example of two of the three bloggers

A new geography of researcher mobility is emerging, with India and China becoming the leading and most innovative research countries in the world.

referred to in the beginning shows that in 2008 the picture of a "brain drain" from the East to the West does not anymore reflect reality. On the postdoctoral level we know that the U.S. offers the majority of posts worldwide. Stay rates show that there can be no doubt as to the fact that American research institutes are successful in attracting some of the best out of this already selective group of people. Americans have been, and still are able to win and keep the best of the best.

The future geography of researcher mobility

The question which has to remain open at this point is, however, how long this picture will remain as we have come to know it. A new phenomenon is the reverse flow of researchers to countries such as China. For many years Chinese researchers have left the country, predominantly for positions in the United States. 80% of all Chinese students who left China in the past decades to study abroad stayed abroad, and yet whereas those who left China in the 1980s wanted to work abroad for 15 or 20 years, their children now want to work overseas for only four or five years. According to another estimate, 30,000 Indian IT-specialists have returned from the U.S. to India in recent years, forming a group of experts that spark innovations in their home country based on the knowledge and expertise which they have gained overseas, in the computer labs of Silicon Valley. A few years ago, Chinese universities and, among others, the Chinese Academy of Sciences started to also actively recruit Chinese born researchers





Table 2: German academics and researchers abroad in 2005 by funded groups and by target countries (slightly modified) Source: DAAD ed. (2008)

Target country	Graduates	Post-docs	Researchers/ academics	Researchers in total
1. USA	814	455	63	1,358
2. UK	412	109	28	549
3. France	205	68	24	344
4. Russian Fed.	52	2	135	219
5. Italy	136	23	17	193
6. Japan	117	19	43	190
7. Switzerland	114	60	11	186
8. Australia	87	37	13	137
9. Canada	52	50	7	109
10. China	73	9	24	106
11. Poland	63	2	27	102
12. Netherlands	57	26	1	84
13. Spain	60	14	3	77
14. Hungary	32	0	38	70
15. Israel	36	24	3	63
16. Sweden	47	11	1	61
17. Austria	42	5	5	52
18. Brazil	40	4	6	50
19. India	35	2	13	50
20. Bulgaria	2	0	47	49

abroad for domestic positions. This might indeed herald a new geography of researcher mobility, as predicted by analysts of the American National Intelligence Council, with India and China becoming the leading and most innovative research countries of the world. While there can be no doubt as to China's and India's higher education explosion, it is, of course, also true that their institutions of higher learning and research have not yet reached an internationally competitive standard on a broader scale. In 2005, German academics and researchers by wide margins still clearly preferred the U.S., followed by the U.K. and France, with China taking rank 10 and India only taking rank 19 (Table 2).

Yet ambitious government programs to elevate domestic research universities in China and India are underway or have already been implemented; and while the number of German researchers working at American universities is not as high as by far are the numbers of those from China, Korea, India, and Japan, there can be no doubt that Germany and Europe as a whole have to face an even stiffer competition for well-trained, cutting-edge researchers in the future.

Mere size is not everything

It is true that large nations with strong financial support for higher education and research and strong research universities respectively have a competitive advantage on the international labor market for research talent. It is also true that nations such as France and Germany do not necessarily depend on incoming faculty, but have a broader choice of strategies to compete, ranging from the reactive mode of attraction to a proactive mode of recruitment. And of course the number of German researchers in the U.S. also reflects the fact that the German job market cannot offer enough adequate positions, whereas, for example, students from Germany seem to have no problem to be accepted to American elite universities. The international reputation of our higher education and research system is surely better than we Germans like to admit, and this might also be reflected by the fact that 80% of all post-docs at Max Planck Institutes (MPI's) and 25% of all MPI directors are international researchers. Mark Stitt, who will later on share his thoughts on strategies to win the best international research talents, is but one example. Yet the picture is still more complicated than that, as – again – mere size is not everything.

Large nations with strong financial support for higher education and research and strong research universities respectively have a competitive advantage on the international labor market for research talent.

Smaller countries can hardly abstain from actively engaging in the global academic market. They have to be the frontrunners in order to stay in control of their own affairs. Singapore has lured international researchers to its research centers. Sweden, Finland,

or Switzerland, for example, have outstanding research universities which attract large numbers of researchers worldwide. Alternatively, smaller countries can form regional networks and consortia as can be seen within Europe where global competition led to the founding of the European Research Area (ERA), which highlights the fact that the question of what is needed to make Germany more attractive to excellent researchers is not only a question of national, but one of European dimension. The European Commission has dealt with it for many years. According to analysts in Brussels, 700,000 additional researchers have to be employed by 2010 in order to meet the Lisbon targets. As of 2008, it appears rather doubtful that Europeans will reach the ambitious goals they have set themselves.

What are key conditions necessary to attract international researchers?

With the old bi-polar world of the Cold War giving way to a multi-polar world of international science and research, and a new geography of science and innovation emerging, an increasing number of countries aims at attracting foreign doctoral students, post-docs, and advanced researchers as well as expatriate academics into their national research systems. What are key conditions necessary to recruit international researchers? Simon Marginson and Marijk van der Wende, the authors of a 2007 OECD Education Working Paper on "Globalization and Higher Education" name the following conditions to attract highly skilled academic talent:

- "a strong resource base underpinned by state support for academically controlled basic research;
- an executive steering capacity able to concentrate resources in key strategic fields and projects;
- a mass of established and emerging researchers of high caliber across a range of fields, including emerging areas of strategic significance;

- conditions of institutional autonomy and academic freedom including the license to develop cross-border collaborations;
- communications capacity in terms of both ICT systems and English language competence;
- conditions of work and life sufficiently attractive to foreign staff and students, including adequate salaries as well as appropriate career opportunities;
- and extensive global engagement with universities abroad, ideally with strong people flows of faculty and students in both directions." (Marginson/ v.d. Wende 2007, p. 39)

Addressing shortcomings in national policies that may limit the supply of researchers, and ensuring that the wider environment for innovative research and scientific endeavor is sound, are key policy challenges for countries around the world. Naturally this is true for Germany as well. The "Strategy for the Internationalization of Science and Research," passed by the Federal Government of Germany in early 2008, was a significant attempt to face the challenges of globalization. The "Initiative of Excellence," by which the Federal Government aimed at establishing internationally visible research beacons, was another. Its effect on individual universities as well as on the German higher education and research system in general has not yet been thoroughly analyzed, yet a few numbers are out in the open: According to the University of Göttingen, one of the newly elected German "universities of excellence," 60% of all applications for junior research group positions came from abroad. According to the president of the university, an important factor influencing the decision of international researchers to apply were dual-career opportunities and specific measures to allow dual careers: men and women who pursue their careers and take care of their families at the same time. And indeed: fifteen out of ten junior professorships were awarded to women. In addition, review and appointment procedures have been revised. Innovative tenure track models, such as the newly created Heine- and Lichtenberg-Professorships funded by the Volkswagen Foundation, have been established, opening up new perspectives for young researchers with regard to long-term career planning. According to Wilhelm Krull, Secretary General of the Volkswagen Foundation, communication, cooperation, and courage

on the part of funding organizations are essential to attract top-notch talent to Germany and to keep our best senior scientists in the country as well.

A worldwide network of academic excellence: the Humboldt network

Established by the Federal Republic of Germany in 1953, the Alexander von Humboldt Foundation funds academic cooperation between excellent foreign and German researchers. To this end it grants up to 800 fellowships and more than 100 awards annually. Selection is based on individual achievement alone; there are no quotas for country or specialist field. The research fellowships and awards enable foreign academics to come to Germany to conduct a research project of their choice with a host and collaborative partner. With the support of the Humboldt Foundation academics from Germany can undertake a research project as the guest of an alumnus. Once a Humboldtian, always a Humboldtian: The Foundation has created a network of academic excellence of over 23,000 Humboldtians from all disciplines in 130 countries worldwide, among them 41 Nobel Prize winners. Yet anyone who wants to be successful in the global competition for the best international academics and maintain an academic network such as the Humboldt network has to make improvements, and this is true for national higher education and research systems as well as for funding organizations such as the Humboldt-Foundation. With its expertise as basis, the Foundation has therefore expanded its activities beyond sponsorship and networking and has entered the field of counseling in scientific and research policy matters. For this reason, the Humboldt Foundation became a member of the "Alliance" of the big German research funding organizations.

Taking up demands it receives from its worldwide academic network, the Foundation continually contributes to the research policy debates. A ten-point plan was published in 2007 on how to create competitive conditions and an attractive environment for internationally mobile, excellent researchers. The Foundation has used these

demands to revise its entire sponsorship portfolio. The abolition of age limits and the introduction of an allowance for research costs were the most important results, but reference should also be made to the Welcome Center Competition, designed as an excellence initiative for soft factors and aimed at encouraging universities to see their support for international researchers both as a marketing instrument and as part of their internationalization strategy. Last but not least, emphasis should be laid on the newly created Alexander von Humboldt Pro-

Once a Humboldtian, always a Humboldtian: The Alexander von Humboldt Foundation has created a world-wide network of academic excellence.

fessorship, which at up to five million Euro is the most valuable international award for research in Germany. The aim is

to encourage outstanding scientists and scholars to relocate to German universities from abroad on a long-term basis. The bulk of the prize money will be used to build up research teams and equip laboratories; yet the award winners will also receive an internationally competitive salary. Thereby, the Alexander von Humboldt Professorships provide a new impetus for international cutting-edge research in Germany, with effects on structure development, too, for of course with rising competition for academic talent, rising prices for research stars come

The Alexander von Humboldt Professorships provide a new impetus for international cutting-edge research in Germany.

along. The award, however, does not only give universities the opportunity to offer competitive general conditions and long-term prospects for working in Germany, but also to raise their profile. For them, it is a stepping stone to the top league. Eight top-

The research environment in Germany is still far from being perfect.

notch researchers, seven men and one woman, have been awarded an Alexander von Humboldt Professorship in the first round. Six of them are German, have been working abroad for some time, and are now returning home. Thereby one of the goals of the Federal Government's "Internationalization Strategy" is being realized: to promote the internationalization of German universities and to increase the competitiveness of the German higher education and research system in order to win the "best minds" for the benefit of Germany.

In conclusion, therefore, it is fair to say that much has been done to enhance the quality, competitiveness, and worldwide recognition of Germany's research and higher education system in the past years. Yet it is also true that Germany is not alone in its efforts and that, as another participant in the web-log referred to at the beginning of this introduction put it, "the research environment in Germany is still far from being perfect". We should not think that all problems have been solved and all lessons have been learned. Yet this is also the reason why the International Advisory Board of the Alexander von Humboldt Foundation has established an annual Forum on the Internationalization of Sciences and Humanities: to provide a forum for debate and an open exchange of views on global developments in science and research policy, to listen to international experts and discuss examples of best practice from other countries, and to ask the question what we in Germany and at the Humboldt Foundation in particular can learn from other nations' and funding organization's programs and

initiatives. The following pages will document the Forum's discussion of 'strategies to win the best', putting recent German reform initiatives in international perspective. The Alexander von Humboldt Foundation is grateful to all speakers and Forum participants for stimulating reports, inspiring contributions and lively discussions, and to the eminent members of its International Advisory Board for valuable recommendations as well as for hosting this important event on the occasion of its annual meeting.

¹ <http://network.nature.com/people/mfenner/blog/2008/09/19/how-to-lure-german-researchers-back-to-germany#fn10> [13 November 2008].

² See the report in the magazine of the German Academic Exchange Service <http://www.daad-magazin.de/09141/index.html> [20 November 2009] and, as example, the report published by the Frankfurter Allgemeine Zeitung on 11 September 2008, available for download at <http://www.gain-network.org/index.v3page?p=49827> [20, November 2008].

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Reforming Denmark's universities for the global market: A report on strategic steps to meet global competition for talent



In countries that depend on innovation for economic development, attracting the top researchers and scientists is a key element to ensure continued global competitiveness. It is therefore necessary to better understand the push and pull factors that determine migration flows of researchers and scientists (Thorn and Holm-Nielsen 2008).

In a globalized world, people are increasingly mobile. From 1990 to 2000, the stock of foreign population as a percentage of the total population has increased in all OECD countries (Pedersen, Pytlikova, and Smith 2008). In general, the push and pull factors of migration are complex, but immigrants are often attracted to countries where immigrants of their own nationality are already present (Pedersen, Pytlikova, and Smith 2008), which may not be the case for highly educated people. It is therefore important to recognize that attracting top researchers and scientists is not necessarily a natural part of the general migration pattern.

In academia, international mobility is reflected in the increased percentage of foreign students in tertiary education worldwide (see Figure 1) (OECD 2005). The training of students abroad results in a brain drain if these students and subsequently graduates stay abroad, but can also be turned into a valuable brain gain or brain circulation if they return home. A study from China provides an illustrative example showing that Chinese scholars trained abroad were more likely to import foreign technology and capital than scholars trained in China (see Table 1) (Zweig, Changgui, and Rosen 2004). Zweig et al. (2004) describe individual scholars with a globalized perspective, new ideas, technologies, and information as transnational human capital. These individuals are of high value to society.

Increased knowledge about the push and pull factors of researchers and scientists will enable us to develop policies that stimulate brain gain and brain circulation.

Increased knowledge about the push and pull factors of researchers and scientists will enable us to develop policies that stimulate brain gain and brain circulation (Thorn and Holm-Nielsen 2008). The real challenge in the future is not funding, but competition for the most advanced human capital.



Lauritz Holm-Nielsen is Rector of Aarhus University and Chairman of the Nordic Universities Association.

The government's vision was that Denmark should be among the most attractive countries to live and work in.

The Danish government's response to globalization

In 2005, the Danish government set up a Globalization Council comprising representatives of all sections of Danish civil society (trade unions, industrial organizations, companies, the education and research community). It was chaired by the Prime Minister and included the Minister for Economic and Business Affairs, the Minister of Finance, the Minister of Education, and the Minister for Science, Technology, and Innovation, with the task of advising the government on how Denmark could maintain its position as one of the wealthiest countries in the world and a country with strong social cohesion. The government's vision was that Denmark should be among the most attractive countries to live and work in – also 10–20 years from now – and that Denmark should play an active role in the world community.

Figure 1: Percentage of foreign students in tertiary education (1998, 2003). The chart shows the percentage of tertiary students enrolled who are not citizens of the country of study.

Source: OECD (2005)

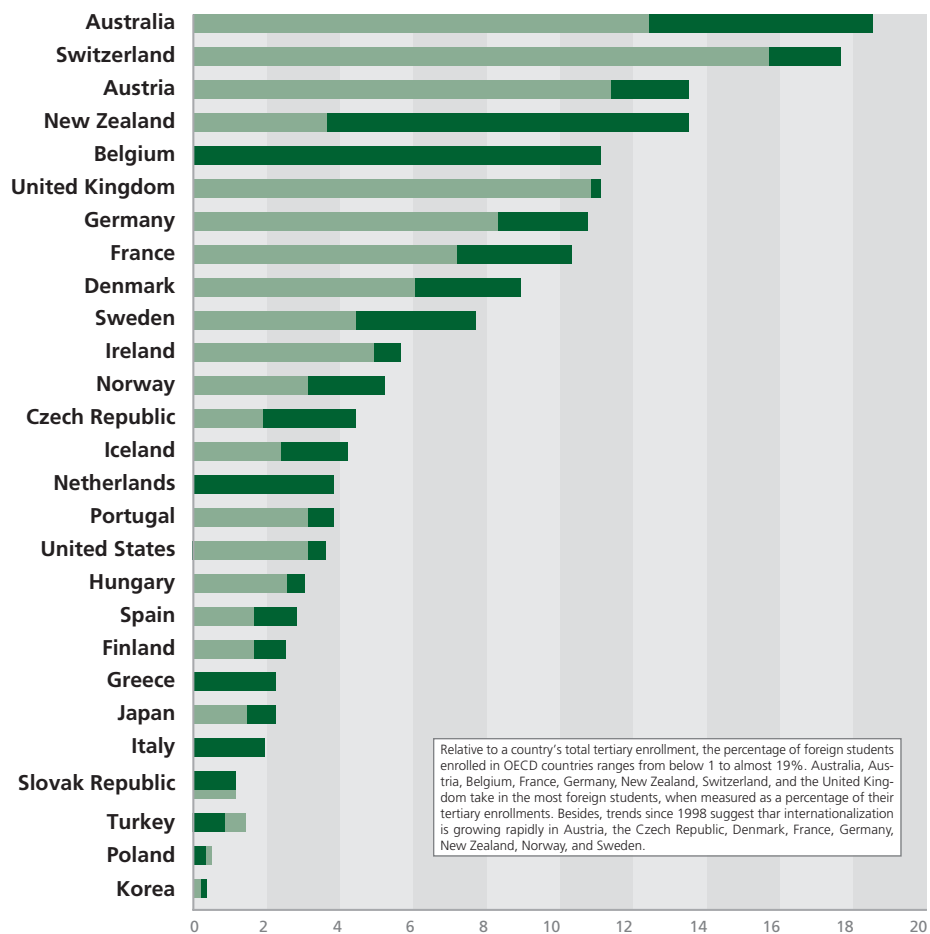


Table 1: Comparing returnees and domestically trained Chinese researchers, 2001 (in per cent). From Thorn and Holm-Nielsen (2008).

	Returnees	Domestically trained researchers
Brought in foreign visitors	36.9	16.3
Helped establish international projects	30.8	10.0
Imported foreign technology	47.7	21.3
Imported foreign capital	23.1	6.3

Notes: The table uses data from a survey carried out in five development zones: Suzhou, Guangzhou, Shanghai, Wuhan and Hangzhou. N = 145.
Source: Zweig et al. 2004

Figure 2: Percentage of foreign students in tertiary education (1998, 2003). The chart shows the percentage of tertiary students enrolled who are not citizens of the country of study.

Source: OECD (2005)

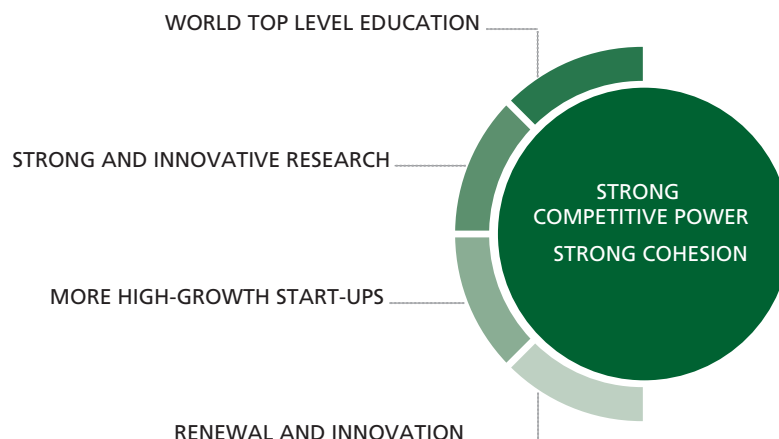


Table 2: The three focus areas within the government’s globalization strategy with specific focus on globalization, education, and research contain a number of key initiatives.

Source: Danish Government 2006

Education and training programs with a global perspective	World top-level universities	More competition and better quality public sector research
<ul style="list-style-type: none"> · Teaching of English should be strengthened · More international activities · New scholarship for studying abroad · Educational institutions should set objectives for internationalization · Targets for the number of study periods abroad · Targets for the number of courses and programs taught in English · Marketing Denmark as an education-oriented country · New Quota 3 for applicants outside EU/EEA · More scholarships to talented foreign students · New grade scale 	<ul style="list-style-type: none"> · The number of PhD scholarships and industrial PhD programs should be doubled · Special Master programs for outstanding students · Universities should have greater freedom to attract talented researchers · The basic university funds should be distributed according to quality · Government research institutions should be integrated in universities · All university study programs should be evaluated according to international standards · Bachelor programs should lead to better job opportunities · Systematic dialogue with employers · Focus on good teaching · The knowledge of universities is to be utilized in society 	<ul style="list-style-type: none"> · More funds for public sector research · 50 per cent of research funds should be subject to competition · Co-financing of Danish participation in international research cooperation · New model for competition between universities · Research grants should cover all costs · Greater number of large long-term research grants · Research grant pool for research infrastructure · More funding towards strategic research · Better basis for prioritizing · Quality barometer and evaluation of large-scale programs

The government's globalization strategy entitled Progress, Innovation and Cohesion. Strategy for Denmark in the Global Economy was published in April 2006 (Danish Government 2006) and contains 350 specific initiatives, which together entail extensive reforms of education and training programs as well as research and entrepreneurship, in addition to substantial improvements of the framework conditions for growth and innovation in all areas of society (see Figure 2). The strategy contains 14 focus areas, and three of these are of specific interest in relation to globalization, education, and research (see Table 2). The focus area entitled Education and Training Programs with a Global Perspective contains initiatives supporting education programs in Denmark with a global perspective, as well as initiatives to attract highly qualified foreign students and teachers to Denmark. The ten key initiatives within the focus area World top level universities were developed to strengthen the position of the Danish universities and to create attractive academic environments that benefit companies in Denmark. The initiatives will furthermore support the conversion of research results into new technologies, processes, goods, and services. The focus area More competition and better quality public sector research included the following two recommendations: (1) publicly financed expenditure on research and development should reach one per cent of the gross domestic product (GDP) in 2010; (2) the proportion of public sector research funds that are distributed on a competitive basis should constitute 50 per cent of the total research funding available in 2010. The parliament (Folketing) subsequently reached a broad agreement on completion of the university reforms, which were initiated by a new University Act in 2003.



The merger is expected to secure professional synergies and ensure better utilization of the country's research facilities, new openings for education and research, and an increase in the universities' international competitiveness.

University reforms in Denmark

New governance system

In 2003 the universities in Denmark became autonomous, with a University Board as supreme authority. Thereby, universities were granted a higher degree of autonomy combined with expanded accountability. The majority of university board members are external, and boards are relatively small (at Aarhus University 11 members). The board appoints the university rector. Every fourth year, the universities sign a development contract with the Ministry of Science, Technology, and Innovation. The development contract contains the university's vision, focus areas, and priorities, and forms the basis for the dialogue with the ministry. Reporting on the goals and milestones in the development contract is included as part of the annual report to the ministry. The university board appoints its own institutional auditors. In all cases, the universities have contracted major international auditing firms to do this work. Furthermore the board is responsible for the acquisition and sale of buildings.

In order to ensure the quality of study programs in an autonomous university system, a new Accreditation Act (2007) was adopted. All



study programs – new as well as existing – have to be accredited with regard to feasibility, quality, and relevance.

New funding scheme

The second fundamental change was that of the universities' financial structure and of the public funding schemes. In 2006–07 the government reached a broad political agreement in parliament (Folketing) on a plan to increase investments in universities, research and innovation (see Table 2).

The agreement ensures that public investment in research and higher education increases significantly and public research investments will represent one per cent of the gross domestic product (GDP) in

2010. Fifty per cent of these research funds will be subject to competition. Competitive research grants will cover the full costs of funded activities and will include an overhead of 44 per cent. Furthermore, the Danish government has launched a series of initiatives for the private sector to reach its share of the EU's Barcelona target of EU countries' research and development expenditures comprising three per cent of GNP in 2010.

New institutional organization

A number of mergers between universities and research institutions took place on 1 January 2007 as a result of the globalization strategy. The previous number of 25 universities and research institutions was reduced to eight research universities and three research institutions. The merger between universities and research institutions is expected to secure professional synergies and ensure better utilization of the country's research facilities, new openings for education and research, and an increase in the universities' international competitiveness. This will ensure that the Danish universities continue to attract highly skilled students and researchers and enable the universities to increase their international visibility. In addition Denmark's more than 90 professional colleges were merged into eight regional university colleges.

Internationalization of higher education in Denmark

Denmark subscribes to the Bologna process and has established the ECTS (European Credit Transfer System) throughout its higher education sector. The international student population in Denmark continues to grow and, since 2002/03, the number of foreign exchange students coming to Denmark has exceeded the number of Danish exchange students going abroad (see Figure 3) (CIRIUS 2008a). More than half of the Danish exchange students study in Europe (see Figure 4).

This is especially the case for students enrolled in medium-cycle or short-cycle higher education. International exchange students coming to Denmark are dominated by European students (81 per cent).

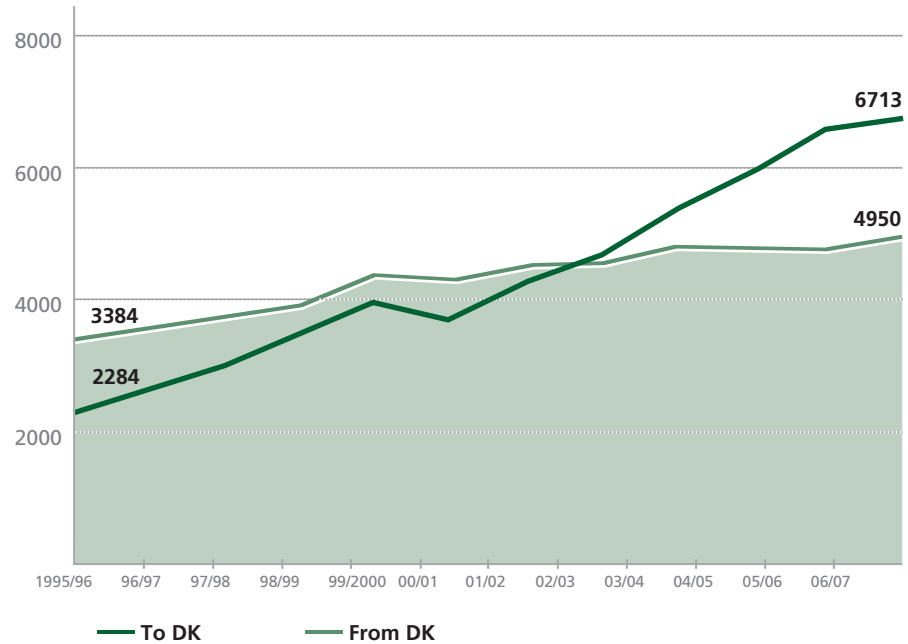
The number of foreign students taking an entire degree in Denmark is increasing, especially at Bachelor's and Master's level (CIRIUS 2008b). One third of foreign graduates find employment in Denmark within a year after receiving their degree and, after three years, one quarter of foreign graduates stay in the country as part of the Danish workforce.

Danish elite programs

As a follow-up on the globalization strategy, elite graduate programs at Master's level are being established at Danish universities. The present twelve Danish elite graduate programs are designed to attract particularly motivated and talented students. The goal is to foster graduates that are able to take on extraordinary challenges in academic research or leading positions in the professional world. In the Danish context, there are currently two officially recognized models for university elite graduate programs at Master's level: elite graduate programs and professionally oriented elite graduate courses.

Figure 3: Development in number of exchange students to and from Denmark from 1995/96 to 2006/07.

Source: CIRIUS (2008)



Danish University spearheads abroad

The globalization strategy emphasizes that more Danish students should study abroad and that Denmark should attract highly qualified students and lecturers. To strengthen mobility and build bridges between research institutions and companies, Denmark has established innovation centers in three globalization hotspots: Silicon Valley, USA, Shanghai, China, and Munich, Germany.

The main focus of these innovation centers is to establish and facilitate direct and personal contacts between leading international research and innovation environments.

In October 2008, an agreement was reached to build a Danish University Center in Beijing, China.

All eight Danish research universities will contribute to the University Center, in partnership with the Graduate University of the Chinese Academy of Sciences.

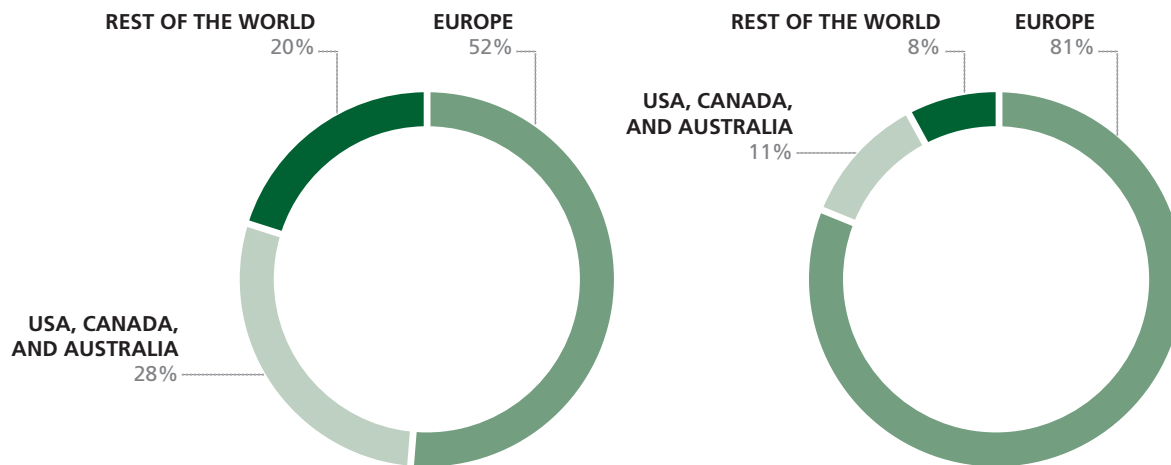
The purpose of the Danish University Center in Beijing is to:

- create greater visibility for Danish research and education in China;
- intensify Danish–Chinese collaboration in selected research areas of mutual interest;
- improve the facilities for Danish students who wish to study in China;
- increase the recruitment of talented Chinese researchers and students to Denmark.

The University Center will provide a framework for research activities and Master’s/PhD programs within prioritized selected fields. Trainee relations to Danish enterprises, both in China and Denmark, are to be established as well. The center will be established over a

Figure 4: Destination choices of Danish exchange students abroad (left) and origin of international students in Denmark (right).

Source: CIRIUS (2008).



The core activities at Aarhus University are defined as (i) excellent research, (ii) focused talent development, (iii) inspiring consultancy and knowledge transfer, and (iv) world-class education and knowledge dissemination.

period from 2009 to 2013. By 2013, the center is planned to provide room for 100 researchers, 75 PhD students and 300 Master’s degree students, about one half being from Denmark.

Aarhus University

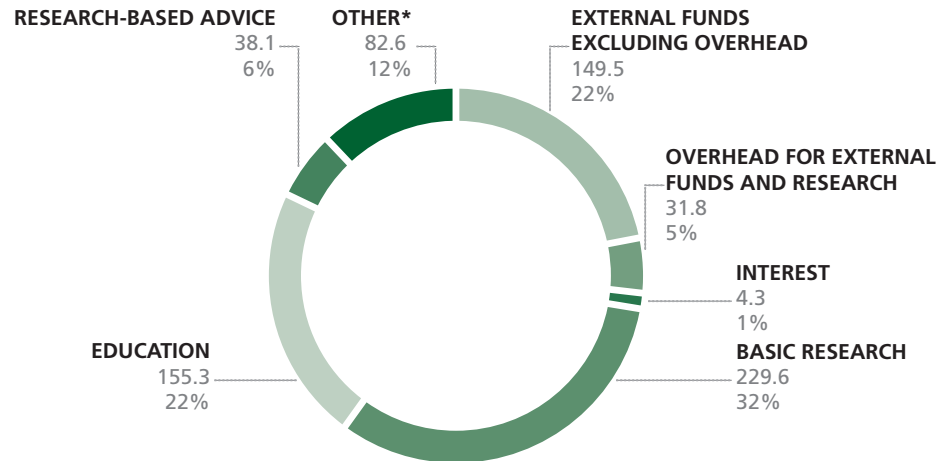
Aarhus University was founded in 1928. After the university merger in 2007, Aarhus University now consists of nine main academic areas. Combined, they cover the entire research spectrum – basic research, applied research, strategic research, and research-based advice to the authorities. Research is the basis of all activities at the university, and in all degree programs, research and education are closely connected

to ensure the depth of the degree programs (Aarhus University 2008). In 2009, Aarhus University has approximately 14,900 Bachelor’s students and 19,000 Master’s students. The focus on PhD education and the goal to double the number of PhD students has resulted in a 44 per cent increase in the annual uptake and it is estimated that the university will have 1,500 PhD students by the end of 2009. The budget for 2009 is DKK 5.2 billion (approx. Euro 687 million) (see Figure 5).

Of this budget, Euro 300 million belong to the competitive research grants portfolio and Euro 150 million are income related to study programs. Aarhus University belongs to the European elite. In two commonly cited ranking lists of the world’s best universities, Aarhus University ranked 81 in the THE QS1 rankings and 93 in the Shanghai2 list in 2008.

Figure 5: Aarhus University budget for 2009 in Euro million.

Other*
includes NERI and external
supplement funds



A strategy for a Danish internationally oriented research university

The four core activities of the Strategy 2008–2012 (2007) at Aarhus University are defined as (i) excellent research, (ii) focused talent development, (iii) inspiring consultancy and knowledge transfer, and (iv) world-class education and knowledge dissemination (see Figure 6).

With the present strategy, the university addresses the recommendations by the government’s globalization strategy and complements these with additional concrete activities.

Focused talent development – the second pillar of Aarhus University strategy

Aarhus University offers research talent development meeting international standards, and its PhD

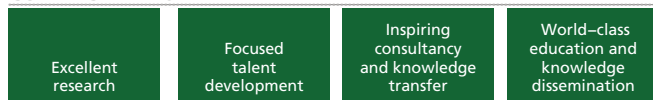
programs are an essential basis for the research and education carried out at the university. The university regards the development of research talent and the recruitment of researchers as a task of high priority to society. The development of research talent at Aarhus University must be generous in the sense that older researchers have a particular responsibility to share their knowledge and experience with the next generation of researchers. The university also wants to guarantee researchers sufficient space and freedom to develop unique talents.

The university has extensive experience with this task, and the important investments in research and development during the past years require that the university optimizes its considerable coaching capacity and doubles the number of PhD students by 2010–11. In addition, Aarhus University needs to create new dynamic career paths for young researchers. The university has concentrated its PhD programs in graduate schools and participates in national graduate programs together with other institutions.

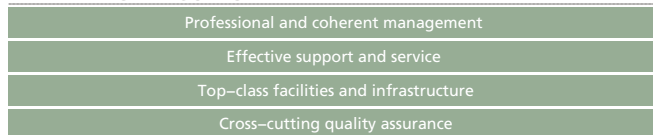
Figure 6: The mission and vision of Aarhus University is focused in four core activities.

Source: University of Aarhus (2008)

CORE ACTIVITIES



INTERNATIONAL SUPPORT



PRIORITIES



The aims and objectives under the heading focused talent development are the following:

- to ensure that the quality of the PhD programs compares favorably with the best in the world;
- to recruit top talents from Denmark and abroad to unique environments, where they feel free to pursue the unexpected;
- to double the number of researchers educated and developed at the university;
- to offer a continuous researcher development program for the greatest talents from the Bachelor’s degree level.

The university has therefore decided:

- to strengthen the university’s strategic international alliances;
- to create a financial framework that enables the researcher development environments to be characterized by creativity and curiosity;
- to ensure that the university’s best researchers can give priority to advising and coaching at Master’s degree, PhD degree and post-doctoral levels;

- to offer a 5-year researcher development program, e.g. from the Bachelor’s to the PhD level or from the Master’s degree level up to and including the postdoctoral level.

PhD student recruitment

Because student mobility increases towards the final years of study, Aarhus University has given special attention to the development of recruitment policies for doctoral programs. Internationally oriented programs and courses are selected through the existing centers of excellence to attract international researchers or students with capacity for academic careers.

In order to allow an early identification and recruitment of outstanding students, Aarhus University has introduced more flexible recruitment procedures for PhD programs. In the well-known 5+3 (3+2+3) Bologna model, admission to a PhD program is offered to students holding a Master’s degree. These students are awarded a PhD scholarship. In the 4+4 model, admission to a PhD program is offered to elite students who have not yet written a master’s thesis and obtained a Master’s degree. These students are awarded a student scholarship for a period of up to two years until successful completion of a PhD qualifying exam followed by a PhD scholarship for a period of up to another two years.

A 3+5 model has also been introduced at Aarhus University, in particular at its centers of excellence. One example is the Prestigious Honors PhD Scholarships available at the Interdisciplinary Nanoscience Centre, iNANO. These scholarships are open to outstanding students belonging to the top three per cent of their class, who have just completed their Bachelor’s degree. These students are offered a five-year PhD program, the first year of which is

designed as a special mentoring training program, in which students have to follow an intense course program as well as being introduced to the research activities and labs at iNANO. From the second year on, PhD students work under the tutelage of a supervisor. Students must still follow a part-time course program in their second year, while during the last three years the students focus exclusively on a PhD project in an international top-class group within the iNANO research program. Currently, more than 100 PhD students are associated with the graduate school in nanoscience and nanotechnology. With its numerous international partnerships

For research universities with ambitions to belong to the top world universities, it is necessary to take part in the competition for elite researchers and scientists.

and students, the iNANOschool is an excellent starting point for an international career. There is strong competition for the available PhD positions at this graduate school, and only the very best graduates are enrolled.

Aarhus University Research Foundation

The Aarhus University Research Foundation supports academic research at Aarhus University. The foundation was established 60 years ago when a donation established Aarhus University as the principal shareholder of a private company. The Aarhus University Research Foundation has allocated separate funds for internationalization such as recruitment of visiting scholars and associate professors, early recruitment of PhD students, co-funding of PhD scholarships, and related training activities in research talent development. In 2008 this endowment reached a capitalized value of approximately DKK 3.5 billion

(Euro 500 million) and DKK 70 million (Euro 10 million) of its proceeds were allocated to research at Aarhus University – half of which for international activities.

Internationalization

The university specifically promotes internationalization through researcher mobility, visiting professorships, sabbatical leave schemes, and international alliances regarding PhD programs. Traditionally, the internationalization of research has been fully decentralized. However, a considerable number of centralized exchange agreements has been established in the past years. These agreements are supplemented by a large number of decentralized partnerships with selected university departments abroad.

In 2007, the university had approximately 600 visiting researchers from abroad and more than 3,000 foreign students. The university has approximately 825 foreign exchange students, while about 760 Danish students study abroad every year. In addition, approximately 2,239

foreign students complete an entire degree at the university (degree students). Finally, Aarhus University offers a growing number of full-time and part-time programs in English, and organizes an intensive summer university. The internationalization of Aarhus University is presently strengthened by administrative support to foreign students and staff, translation of web pages into several languages, and support to foreign scholars and their families through the development of an “Aarhus international community”.

Conclusion

For research universities with ambitions to belong to the top world universities, it is necessary to take part in the competition for elite researchers and scientists. Looking at frequently cited ranking lists, it is clear that universities in certain world regions dominate these lists. Eight Nordic universities rank among the top 100 of the Shanghai list, but only six German universities, despite the fact that the German population is about four times as big as the Nordic population. Rankings of university systems show similar results: here the Danish, Finnish and Swedish systems are among the six highest-ranking

university systems, whereas Germany is placed as number 15 (Ederer, Schuller, and Willms 2008). Although the various ranking lists are highly disputed, similar results are also reflected in rankings done by innovation capacities. Deutsche Telekom Stiftung (2008) has analyzed the capacity for innovation in leading industrialized nations. Once again Sweden, Finland, and Denmark are among the top five countries performing best on the overall indicators for innovation capacity.

The real challenge is not funding, but competing for the most advanced human capital!

In the competition for the top researchers, it is important to be conspicuous. Furthermore, it is crucial to have a thorough understanding of migration flows. The universities with the best understanding of the pull and push factors of researchers and scientists will be able to develop the right incentives, thereby gaining the competitive advantage necessary in the global competition for advanced human capital, and benefiting the general competitiveness of their society. Aarhus University is a young university – only 80 years old – but with its position among the top 100 universities of the world, it has entered into the competition for top researchers and scientists from all parts of the world. This challenge demands visions, results, good policies, attractive academic environments, and effective management to succeed. Aarhus University operates within the framework set by Denmark's recent governance, financial, and structural reforms and combines the university's own initiatives with the initiatives and the funding sources from the government. Aarhus University is prepared to meet these challenges and sustain its position as a top university facilitating the economic and social development of the Danish society.

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**From brain drain to brain circulation:
Recruiting the best science talent for South Africa**



Traditionally the pattern of scholarly exchanges between developed and developing nations has been skewed. Considerably more researchers tend to migrate towards the developed nations in the North in search of supportive environments for conducting research than the trickle who make the journey South. This "brain drain" has been well conceptualized in the literature, and the case studies, especially from Africa, make compelling reading with estimates that an average of 20,000 highly educated Africans have been migrating to the North every year since 1990. More recently Zeleva and others in a special issue of *African Issues*, raised challenging questions about Africa's capacity building, development, transnationalism, and globalization (Zeleva and Veney 2002). The subject of this paper is the initiatives underway in South Africa to manage the challenge of developing, retaining, and attracting research talent pools. The particular focus will be the various interventions managed by the government agency, the National Research Foundation (NRF). These include the incentive funding system for rated researchers, the South African Research Chairs Initiative (SARCHI), the Centers of Excellence concept, and the SA PhD Project.

Instead of becoming fixated on brain drain, the idea of creating favorable conditions for brain circulation has gained ground.

The central thrust of these interventions is that the emergent global knowledge economy demands new ways of thinking and grappling with the challenges posed by highly mobile intellectual capital. Instead of purely becoming fixated on brain drain, the idea of creating favorable conditions for brain circulation has gained ground. The brain circulation model recognizes the potential for a multidirectional,



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albeit asymmetric flow of talent among nations and even reverse flows of knowledge and skills from the center to the periphery (Chen 2008). In the latter instance the experiences of South Korea, Taiwan, China, and to some extent India are particularly instructive (Parthasarathi 2006).

The dominant reality however is that very few countries, if any, are entirely self sufficient in the maintenance of their talent pools and in some instances there may be considerable time lags between investment and a possible return on investment. Consequently, in the short term, the global race for talent manifests itself in an active and often ruthless hunt for talent. The approach that South Africa and the NRF have taken is that a critical mass of home-grown talent needs to be developed and a growing body of new scientists should be actively recruited into the science system. Put another way, for South Africa to be a beneficiary of the global pool of scientific talent, it needs to be an active contributor to that pool.

The NRF receives its mandate from an Act of the South African Parliament and falls into the administrative ambit of the Department of Science and Technology. This legislation lays out the objectives of the NRF in promoting and supporting research through funding, human resource development, and the provision of the necessary high-end research facilities. This is in order to facilitate the creation of knowledge, innovation, and development in all fields of science and technology including the social sciences and humanities and indigenous knowledge systems. This translates into the NRF being the intermediary agency between the policies and strategies of the South African government and those institutions that perform research in the country. Unlike other science councils in the country whose role is research performance, the NRF primarily fulfills an agency role with a smaller portion of its activity allocated to research performance through the National Research Facilities.

Against the backdrop of this mandate, the NRF strategic plan developed in 2008 (NRF Strategic Plan 2008) charts a course for NRF Vision 2015 which inter alia seeks to:

- promote internationally competitive research as a basis for a knowledge economy;
- grow a (demographically) representative science and technology workforce in South Africa;
- provide cutting-edge research, technology, and innovation platforms;
- operate world-class evaluation and grant-making systems;
- contribute towards a vibrant national innovation system.

This vision statement is not value neutral. It positions the NRF within a particular national, continental, and international political, socio-economic, and intellectual context. At the first level, South Africa sees itself as evolving into an integral part of the global knowledge economy. The apex of the pyramid is therefore world-class research. A history of three centuries of race and class oppression in South Africa presents compelling dynamics of privilege and neglect, especially in human capacity development. The imperatives of access and equity especially for black people and women are prominent in the NRF's thinking as it prioritizes a transformed society. Thirdly, given its wide-ranging research promotion and support activities, the NRF is alert to discharging these with the focus on a sustainable environment.

From a policy point of view, the NRF was informed by a number of interrelated policy statements including the Accelerated and Shared Growth Initiative - South Africa (ASGISA), the Joint Initiative for Priority Skills Acquisition (JIPSA), and the Department of Science and Technology's Ten-Year Innovation Plan for South Africa, which identifies five grand challenges in the country's scientific endeavors. While the first two policy statements have yet to generate significant momentum, the latter provides a very useful framework within which the NRF seeks to roll out its mandate.

In a nutshell the Ten-Year Innovation Plan contains the elements the country requires "to produce a generally innovation-literate society and workforce, thus contributing greatly to the strengthening of South Africa's competitiveness in the knowledge era and arena." The Plan "proceeds from the South African government's broad socio-economic mandate – particularly the need to accelerate and sustain economic growth – and is built on the foundation of the national system of innovation (NSI)." Quite importantly it recognizes the tremendous gap between South Africa and the knowledge economies of the world. Among the elements that the Plan is driven by is human capital development. The Plan develops a series of grand challenges that seek to address an array of social, economic, political, scientific, and technological benefits. The grand challenges it identifies thus are:

1. The "Farmer to Pharma" value chain to strengthen the bio-economy – over the next decade South Africa must become a world leader in biotechnology and pharmaceuticals, based on the nation's indigenous resources and expanding knowledge base;
2. Space science and technology – South Africa should become a key contributor to global space science and technology, with a National Space Agency, a growing satellite industry, and a range of innovations in space sciences, earth observation, communications, navigation, and engineering;
3. Energy security – the race is on for safe, clean, affordable, and reliable energy supply, and South Africa must meet its medium-term energy supply requirements while innovating for the long term in clean coal technologies, nuclear energy, renewable energy, and the promise of the "hydrogen economy";
4. Global climate change science with a focus on climate change – South Africa's geographic position enables the country to play a leading role in climate change science; and
5. Human and social dynamics – as a leading voice among developing countries, South Africa should contribute to a greater global understanding of shifting social dynamics, and the role of science in stimulating growth and development.

The NRF's mandate to meet these grand challenges is addressed via the three arms of its overall infrastructure. The first is the Research and Innovation Support and Advancement (RISA) arm. RISA is the intermediary between the research institutions and researchers and is the grant-making side of the business. RISA also facilitates partnerships and knowledge networks and supports and provides science and technology information to guide and steer strategic decisions. Its key objectives are to ensure appropriately qualified researchers and high-level infrastructure to produce the knowledge to make the country a global competitor. Public education and the communication of advances in science and technology are addressed through its South African Agency for Science and Technology Advancement (SAASTA) arm. High-end research is carried out through the National Research Facilities in areas ranging from astronomy through to nuclear sciences and biodiversity and conservation.

From this infrastructure as an enabling framework, the initiatives that speak directly to the capacity development imperatives that are managed by the NRF include:

Incentive funding for rated researchers

The NRF evaluation and rating system is a benchmarking system based on expert opinions from peers locally and abroad. The expert reviewers base their opinions on the quality and impact of each applicant's research outputs and achievements. The system serves as a mechanism to nurture scholarship and grow the country's research capacity. It reinforces the importance of internationally competitive research and stimulates healthy competition between researchers and research institutions. The system recognizes researchers who produce quality research outputs and remain internationally competitive. Several higher education institutions use the results of the NRF evaluation and ratings process to position themselves as research-intensive institutions and to recruit more research leaders. Others use it as a tool and an incentive to develop research staff. Evaluation and rating of researchers in the natural sciences and engineering date back to 1984 while researchers in the social sciences and humanities started participating in the process in 2002.

While the incentive funding provided by the NRF can be criticized for not providing comprehensive funding to researchers, it does provide an important incentive. Based on a grading system of the elite categories from A to C and then special categories P, Y, L that recognize younger researchers and new entrants into the research system, the awards range from R 40,000 to R 100,000 per annum and are for the duration of the rating over a period of six years.

This continuity funding or "glue money" is a powerful incentive for researchers to remain in academia, continue and enhance the quality and impact of their research, and to use its leverage to access other research funds and accommodate graduate students.

Centers of Excellence

The South African government's National Research and Development Strategy developed in 2002 identified the need to create "centres and networks of excellence" in science and technology, including in the social sciences, as a key component of the human capital and transformation dimensions of government policy. It envisaged that such centers will stimulate sustained distinction in research while simultaneously generating highly qualified human resource capacity in order to impact meaningfully on key national and global areas of knowledge.

Among the established DST/NRF

Centres of Excellence to date are the:

Centre for Biomedical TB Research – which seeks new tools for the diagnosis, treatment, and prevention of tuberculosis, based at the Universities of the Witwatersrand and Stellenbosch,

Centre for Invasion Biology – which addresses the biodiversity consequences of biological invasions, based at the University of Stellenbosch,

Centre of Excellence in Strong Materials – which seeks to understand and improve the properties of advanced strong materials to increase efficiency and reduce costs, based at the University of the Witwatersrand,



Continuity funding or "glue money" is a powerful incentive for researchers to remain in academia, continue and enhance the quality and impact of their research and to use its leverage to access other research funds and accommodate graduate students.

Centre of Excellence in Birds as Keys to Biodiversity Conservation, at the Percy FitzPatrick Institute at the University of Cape Town,

Centre of Excellence for Catalysis, which looks at innovation in catalysis as a key process in the chemical and manufacturing sector, at the University of Cape Town,

Centre of Excellence in Tree Health Biotechnology, which seeks the understanding and combating of diseases of South African indigenous trees, based at the University of Pretoria,

African Centre for Climate and Earth Science System (ACCESS), which undertakes modeling approaches to better understand coupled Southern Oceans, Atmospheric, and Earth Systems, at the Council for Scientific and Industrial Research (CSIR) and the University of Cape Town,



Centre for Excellence in Epidemiological Modeling and Analysis, which looks at mathematical modeling to understand, predict, and combat diseases, at the Stellenbosch Institute for Advanced Studies.

While the NRF works in tandem with the DST in the Centres of Excellence initiative, the NRF remains the main managing agency for this strategic initiative.

South African Research Chairs Initiative (SARCHI)

The initiative is a strategically focused knowledge and human resource intervention that has five interrelated objectives:

1. to increase the number of world class researchers in South Africa;
2. to retain and/or attract back qualified research scientists to the higher education sector and thereby:
 - a. to help reverse the systemic decline in research outputs, focus, and capacity at publicly funded higher education institutions (HEIs), Science Councils, and other research institutions;
 - b. to strengthen and improve the capacity of HEIs, Science Councils, Museums, and other research institutions (e.g. university linked teaching hospitals) to generate and apply new knowledge;
3. to stimulate strategic research across the knowledge spectrum and thereby increase the level of excellence in research areas of national and international importance;
4. to create research career pathways for highly skilled, high quality young and mid-career researchers that effectively address historical racial, gender, and age imbalances; and
5. to improve and accelerate the training of highly qualified personnel through research. The aim of the initiative is to make South Africa competitive in the international knowledge economy based on its existing and potential strengths.

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SARCHI's target is 210 chairs by 2010. As at the end of 2008, 70 chairs had been established with a further 16 chairs to be awarded in 2009. The current economic climate dictates that the roll-out of this initiative is likely to be affected. However, given the level of seniority and prominence of the scholars selected onto this initiative, they serve a useful role in mentoring the next generation of researchers and thereby contribute towards the capacity development imperatives of the country. Presently, 30% of the chairs have been recruited from abroad with this number targeted to rise to 66%. There is a clear alignment between SARCHI and the country's R&D strategy as well as the DST's Ten Year Innovation Plan.

The SA PhD Project

The South African PhD Project is an initiative of the NRF supported by the Department of Science and Technology (DST). The program strives to address the local human capital requirements by increasing the number of qualified postgraduate professionals in the country.

With the premise that a highly skilled workforce is central for a knowledge-based economy, the rationale behind the project is that PhD graduates can contribute to all sectors of the economy beyond the academic and research related areas. South Africa produces 26 PhD graduates per year per million of the population based on 2005 OECD figures.

This is currently way below the number of doctoral graduates required to support a knowledge-based economy. Furthermore, this rate of production is particularly alarming when compared to countries such as Brazil, Taiwan, and South Korea, which are the comparative league for South Africa. These countries produced 43, 53, and 157 PhDs per year per million of the population respectively, in the same time period. The target of this initiative is a five-fold increase in the number of South African PhDs produced by 2025 to place the country into the 100 PhD's per million of population per annum bracket.

The higher education sector in South Africa does not have the required numbers of adequately qualified staff, with only a third of our instructional, research, and technical staff employed at higher education institutions possessing a PhD qualification. It is crucial to significantly increase this number for local higher education institutions and research organizations in order to become globally competitive in all areas of research and scholarship.

The South African PhD Project is a marketing and postgraduate student support program, as well as an information hub for postgraduate students, training partners, funders, and sponsors. It encourages and directs potential candidates to suitable PhD programs and provides peer and mentor support networks as they initiate and progress through their studies and become professionals or leaders in their

respective disciplines. The qualified PhD graduates serve as role models and mentors for attracting and mentoring the next generation of students. The project partners with government, higher education institutions, local and international corporations, funding agencies, foundations, science councils, and other organizations to provide support to postgraduate students.

The four initiatives detailed above also have synergies between and among them, leading to each drawing on the other at appropriate points. This was not the intention at the outset but a valuable unintended consequence nonetheless.

The amalgam of strategies which align to the country's developmental imperatives and policy positions represents a forward-looking paradigm which may not break the centuries-old dilemma of the North feeding off the best talent of the South but which in the final analysis is a carefully thought-out, conscious engagement with a major challenge of the contemporary global economy.

This interaction was assisted by the fact that the NRF/DST is the common denominator in these various initiatives. The net value of the NRF's initiatives is that by creating opportunities and incentives for developing new scientific skills, the skills pool of the country is significantly enhanced. While a cynic might take the view that developing countries invest in high skills that eventually end up in

the North, the optimistic perspective assumed by the NRF is that South Africa is an integral part of the global knowledge economy, that this translates to the acceptance that if one is dependent on the global talent pool one should actively contribute to it. The quest to train, retain, and recruit the best scientific talent remains prominent on the NRF's agenda. The alternative, too ghastly to contemplate, is to wring one's hands in despair lamenting the brain drain to the North. This amalgam of strategies which align to the country's developmental imperatives and policy positions represent a forward-looking paradigm which may not break the centuries-old dilemma of the North feeding off the best talent of the South but which in the final analysis is a carefully thought-out, conscious engagement with a major challenge of the contemporary global economy. By creating a research environment and infrastructure conducive to supporting some of the best talent in the world South Africa intends to remain a significant talent attractor in the global science landscape.



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Developing strategies to win the best for Poland: The Foundation for Polish Science



Before introducing the Foundation for Polish Science (FNP) and its role in selecting and helping the best researchers in Poland, the effects of the watershed of 1989 as well as the present structure and rules of financing the Polish R&D sector are presented. This will not only provide a better understanding of the Polish situation, but also put the Foundation's activities in the historical and political context.

The effects of the watershed of 1989 on the Polish R&D sector

Poland is a large country with a population of 38 million, aspiring to the role of a political and economic leader in the Central and Eastern European region, and a European Union member since May 2004. However, Poland is also a country where short-term problems overshadow the capacity for strategic thinking, because unfortunately R&D is financed only to a very limited extent. Since the watershed of 1989 – the Round Table talks and the peaceful assumption of power by the anti-communist opposition, one of the consequences being also the fall of the Berlin wall – spending on R&D measured by the share of the Polish GDP has decreased with each year. In 2006 this was 0.56% of GDP and practically no growth was seen in the next two years, 2007/08 (Central Statistical Office 2007). Note that the share of funding for basic research in 2006 was 0.18% of GDP. We mustn't forget, of course, that after a brief period of GDP collapse at the onset of the transformation (experienced by most CEE countries at the start of the changes), Poland's GDP has been growing steadily, though not fast enough compared to other countries in the region. In absolute terms, though, GDP in 2007 was more than 50% higher than in 1989. This means that while the percentage share of spending on R&D kept decreasing since 1990, thanks to GDP growth and the growing strength of the Polish zloty, spending remained practically unchanged over these 20 years. In absolute terms, in 2004 Poland's per capita spending on science was just 17 Euro, which was



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about 10 times less than the average for the other EU countries (167 Euro per capita per year) (Frank 2006)!

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The scale of financing in science is just one problem we are struggling with today. Another one is the definitely outdated structure of science and research. From the times of real socialism, Poland has inherited an inefficient and ineffective science sector structure – 125 state-run university-level schools, 81 institutes of the Polish Academy of Sciences (PAN), and over 200 R&D units that theoretically were responsible for R&D projects and for putting them into economic practice. After 1990, many private universities were set up (there were 318 in 2006) but only some of them meet proper teaching quality standards, not to mention research standards. Because the number of employees in the science sector with PhDs or higher degrees has not changed fundamentally in recent years (approx. 60,000–63,000) (European Innovation Scoreboard 2006), and neither have salaries at state universities grown

(the average salary of a state university professor is almost 3 times less than in Germany – 2,200 Euro per month compared to 8,000 Euro per month), the emergence of numerous private schools led many academic staff members to start working in several jobs. This juggling of multiple jobs had a negative impact on the standard of such employees' research work. The distribution of state funding assigned for science and R&D among the sectors – universities, PAN institutes, and R&D units – is more or less proportionate to the number of researchers employed in those sectors.

Another unquestionable barrier to the development of science in Poland, especially in terms of R&D, is that the industrial sector accounts for just 30% of R&D spending.

Another unquestionable barrier to the development of science in Poland, especially in terms of R&D, is that the industrial sector accounts for just 30% of R&D spending. In most OECD or EU countries, the situation is the exact opposite, with two thirds of R&D funding coming from the economy. After 1989, regardless of political option, successive Polish governments have failed to create any real mechanisms stimulating investment in research and innovation from non-government sources of funding. While in advanced economies R&D is largely financed by the industrial sector, in Poland it depends on the state budget, which in practice means that the decisions as to which developmental programs will receive funding is made by a civil servant, sometimes a politician, but not the market! This flawed mechanism has led to a situation in which Poland is close to last in the EU in terms of innovation, and in 2005 the European Innovation Scoreboard included

it in the group of countries which are steadily losing ground to the European innovation leaders (European Innovation Scoreboard 2006).

Despite continual under-funding, the relatively high standing of basic research carried out in Poland was stimulated by the introduction of a competitive peer review system after 1989.

However, despite continual under-funding, in terms of the development of basic research, when the number of citations of the best scientific papers that are ground-breaking in a given scientific field is used as a measure of scientific achievement, Poland is only slightly behind Japan or Ireland (King 2004), countries which spend many times more money on R&D. Polish physics is classified in 13th place among 160 countries of the world, mathematics enjoys a similarly high position (15th), as do astrophysics and chemistry (17th) (Essentials Science Indicators 2006). This relatively high standing of basic research carried out in Poland was stimulated by the introduction of a competitive peer review system after 1989, which allowed for research funding on the basis of projects proposed by researchers themselves. Competitions for grants were initially held by the State Committee for Scientific Research (KBN), and later by the Ministry of Science and Higher Education. It needs emphasizing, though, that this stream of funding for science was never the main way in which money was assigned for research. When the KBN was set up, 19% of the budget for science was given to researchers through competitions. The way the funding is distributed today, the share of competitions has decreased to 13% of the total budget for science. Most of the funding earmarked for science (depending on the year, this varies from 65% to 70%) is committed to maintaining the structure ("statutory activity"). Over the past 10 years, to rationalize spending on the statutory activity of individual research units, successive research quality evaluation systems were introduced. However, given the already limited funding assigned for science from the state budget and the strong position of various pressure groups, no government actually took appropriate financial measures against units receiving poor marks and failing to meet basic standards – and unfortunately there are still many of these in existence.

As of 1991, we have observed substantial growth in the number of university students, as another element of the image of science in Poland. In the 1980s, just under 7% of the Polish population had a university education. Today this has grown to 15.3%. Unfortunately the growth in the number of students has not brought growing outlays on higher education (approx. 4.5% of GDP today), resulting in rapid deterioration of the quality of teaching. The number of PhD students has also grown significantly since the start of the transformation (1991: 1,600 PhD students, 2004: 33,000 PhD students), and the number of PhDs granted tripled in 1995–2006 (from just over 2,000 in 1995 to over 6,000 in 2006). We need to remember, though, that over half of that number were PhDs in the humanities and social sciences. We continue to have a dangerous deficit of PhDs in engineering, exact, and life sciences. PhD stipends are provided to just some of the students, seldom exceed 300 Euro per month, and are only partially reimbursed (in the case of higher education through a teaching subsidy). Despite the increased number of PhDs, Poland has not created a comprehensive system of postdoctoral grants (a small-scale system existed in 2005–2007, and there are plans to restore it). Freshly promoted PhDs may be employed in higher education and by PAN institutes in the position of adiunkt (assistant) with a salary seldom higher than 800–1,000 Euro per month. At some universities and PAN institutes this is employment for a maximum of 9 years, until they obtain their postdoctoral degree (habilitation). Some young researchers leave for research traineeships abroad. According to a survey commissioned by the Foundation for Polish Science in 2008, this trend accounts for no more than 5–6% of researchers in Poland. Unfortunately most PhDs join or return to the home unit where they prepared their doctoral dissertation. The mobility of researchers in Poland is thus negligible, and there are no regulations in place to stimulate it.

Reforming the Polish science system

After a wave of media discussions on the condition of Polish science (the Foundation organized a TV debate in 2007 featuring such participants as Professor Ernst-Ludwig Winnacker [ERC], Professor Dieter Imboden [EUROHORCs] and Dr. Wilhelm Krull [Volkswagen Stiftung]) and the publicity surrounding the fact that no young re-

searcher chose a Polish research unit (out of 207 applicants) as a place to conduct the prestigious European Research Council (ERC) Starting Grants, the present government appointed a team of experts who proposed some fundamental changes to the system of financing science in Poland. The work of this team resulted in a package of 5 draft laws which the government submitted to the parliament after discussions with the scientific community.

The main idea of the reform consists in increasing the role of the competitive element in applying for

The main idea of the reform consists in increasing the role of the competitive element in applying for research funding, with topics being proposed by the researchers (bottom-up approach).

research funding. It is proposed that a new agency – the National Science Centre (NCN) – be established and made responsible for the peer review funding system for projects in basic research, where the topics will be proposed by the researchers (a bottom-up approach). This institution, modeled after the ERC, will be independent of the government. The NCN will also be responsible for a system of grants for PhD and postdoctoral students. Changes have also been proposed to managing the already existing National Research and Development Center (NCBR), the agency tasked with distributing funding – by way of competitions – for R&D projects whose topics are compatible with priorities specified by the government (a top-down approach). At the same time, the government has declared that spending on R&D will increase by 28% in 2009, and over the next three years by at least 15% annually in relation to previous years. These extra funds are to be spent exclusively on grant competitions. The scope

of financing for individual research projects is to grow significantly so that it covers the salaries of contractual researchers. Indirect costs, which may increase to 50% of total project costs, will compensate good research units for not having their statutory subsidy increased in subsequent years as well as create a mechanism in which research unit managers will find it worthwhile to hire good researchers capable of winning grant competitions. Hiring people for research positions should take place via international competitions. A minimum 15% of the NCN and NCBR budgets should be earmarked for start-up grants for young researchers building their own research teams. In 2009–2011 all research units (approx. 1,100) will be subjected to an external audit evaluating their research topics and financing systems. After this time, a unit's statutory subsidy will be replaced with a base subsidy covering only the unit's maintenance costs and the costs of employing persons key for the unit's development. Any scientific research should be carried out with the help of external grants obtained by the unit. After a successful external audit, the best R&D units will receive state institute status. Parallel to these changes, after joining the EU Poland gained access to structural funds, of which a large part – over 5 billion Euro – will be spent on: scientific research (1.3 billion Euro), scientific infrastructure in R&D (1.3 billion Euro), infrastructure for universities (0.6 billion Euro), human capital for science (0.8 billion Euro), and almost 1 billion Euro on regional and cross-border projects. These projects will be carried out in 2007–2013. The reform of higher education will be carried out in stage two, once the competition mechanisms for financing research start working. At present the guidelines of the reform are being discussed.



The Foundation for Polish Science

The Foundation for Polish Science (FNP) is a non-governmental, financially independent non-profit organization. It is the Foundation's task to support the best researchers and research teams working in Poland. The Foundation's Board, responsible for the Foundation's day-to-day activity, makes decisions on assigning funding to the best applicants selected using an international peer review system. The Foundation's Council, comprising seven professors who enjoy prestige in the Polish scientific community, fulfills the role of a supervisory board, among other things approving the Foundation's activity program once a year, approving the management board's report and the organization's annual budget. I think an element worth highlighting is the transparency of the Foundation's activities, including its financial operations, which is why the Council appoints an external company every year to perform a financial audit of the Foundation. Each year the Foundation publishes its financial statements (including an audit report) and activity report, and also an alphabetical list of reviewers involved in the peer review procedure (in 2008 the list contained more than 600 names).



The Foundation operates on the basis of the law on foundations as a private institution, even though it was established in December 1990 – at the very start of the system transformation in Poland –, after the Polish parliament decided to provide it with founding capital of 24 million Euro (according to the value of the time) from part of the funds of the Central Fund for the Development of Science and Technology which was being liquidated at the time. In addition, in 2003/04 the Ministry of the Treasury transferred about 13 million Euro to the Foundation, from the privatization of Treasury-owned companies. Apart from these funds, the Foundation receives no other subsidies and its statutory activity is financed from income from investments on the financial market – in instruments admitted to public trading such as Treasury bills, bonds, and

shares. This income is spent on program costs and on securing the value of the organization's funds. In December 2008 the Foundation's assets had a market value of about 100 million Euro. In the course of its 18 years of operation the Foundation has spent more than 80 million Euro on its statutory activity. Based on its own funds, the Foundation will offer almost 20 programs in 2009, most of them involving direct assistance for the best researchers. In addition, thanks to 70 million Euro in structural funds for 2009–2013, the Foundation will run four new programs.

Polish strategies "to win the best"

Answering the question: "How to win the best?", I think it's worth highlighting several elements of the Foundation's policy and looking at the guidelines we follow when developing our programs and reaching decisions on granting funds: First of all, aware that the Foundation's spending on its statutory goals is less than 1% of the funds spent by the Ministry of Science and Higher Education on science in Poland, the Foundation assigns huge importance to making sure it supports truly the best people. The success rate in the individual programs ranges from 15% to 20%, and in some programs

does not even exceed 10 %. Neither does the Foundation set any preferences as to discipline. Secondly, the Foundation's programs are built in such a way as to help the best researchers at every stage of their scientific career – from PhD studies, through the postdoc stage and building their own team, to the stable time of consolidating the school these researchers have created. In this context, the main focus is on the stages before the young researcher achieves scientific and financial independence. Most programs are available to Polish and foreign applicants, on condition, however, that their research plans will be carried out in Poland. Most of the Foundation's programs also have a stipend component on which the beneficiaries do not have to pay income tax. This stipend is to make sure the best researchers have worthwhile work for decent remuneration.

The Foundation is a private institution and the money it has at its disposal is not public, which is why the Foundation allows beneficiaries relative freedom in deciding how the money they receive should be spent. This is due to the trust the Foundation places in the winners of its programs. It is the Foundation's belief that thanks to multiple-stage selections (including direct interviews) based on international peer reviews, we are able to choose the best researchers, people who know better than we do how to use the funding they receive. For procedural reasons, such a flexible approach to projects will not be possible with the funding from EU structural funds, but one of the reasons the Foundation applied to receive such funding was that we wanted to release prospective beneficiaries as far as possible of the burden of various bureaucratic procedures, taking the accounting and reporting upon ourselves.

The Foundation's strategy "to win the best" can be traced on the basis of dedicated programs for young researchers at the start of their scientific careers. Young scientists preparing their dissertations can apply for the START program. Each year we receive about 1,000 applications, and after the first review about 100 applicants are rewarded with an untaxed one-year award with the opportunity of extending it for another year. The two main criteria in this competition are the quality of research papers published so far and an action plan for the year of the award. To take part in the competition, the researcher needs to be young – under 30 – and have some kind of scientific achievement to his or her credit – publications, patents, or prototypes. A small group of award holders selected in an assessment procedure each year attend a meeting with Nobel Prize winners organized by the Lindau Foundation, with which we have signed an agreement. In addition, as of 2009 the best researchers in their respective fields will receive extra money for brief foreign visits to find the best research centers for their postdoctoral traineeships. The START program helps us to win the best; through it, the Foundation does the best it can to help even this small group of young people to stay in science in a situation where they cannot count on financial support from their university even though they represent a high academic standard.

From EU structural funds, the Foundation has initiated a program financing research undertaken by PhD students as part of international PhD studies. Every Polish unit with the right to run PhD studies can apply in this competition and obtain funding: stipends (about 900 Euro per month for each PhD student paid over four years) and extra funds for

scientific research (up to 10,000 Euro per year per student). The conditions on which a given unit can receive funding for international PhD studies are the quality of the institution's research and the quality of research represented by the foreign partner or partners.

Young people up to four years from obtaining their PhD can enter a competition for a grant to cover the costs of a one-year postdoctoral foreign traineeship (the KOLUMB program). There are three criteria: the quality of previous scientific achievements, the proposed research program, and the quality of the research center the applicant wishes to visit. The value of the grants is regulated so as to make it comparable with other grants of its kind awarded by other organizations and institutions for a stay at the unit accepting our grant holder. Thanks to agreements we have signed with the NIH, NSF, Clare Hall in the University of Cambridge and several other institutions, our grant holders choose the best research centers in the world,

The strategy of the Foundation for Polish Science 'to win the best' is based on programs designed for young researchers at the start of their scientific careers.

with very good work conditions guaranteed. Moreover, upon their return to Poland they receive a returning grant. The KOLUMB program has been

running since 1995 and has seen more than 170 recipients. We are proud of the fact that over 80% of our grant holders return to Poland, some of them upon using up the Foundation's grants, others – after completing extra one- or two-year research fellowships they are offered because of the quality of their research.

"To win the best," therefore, also means preventing brain drain and encouraging the best young scientists to return to and work in Poland. After all, there are many Poles preparing their PhDs abroad or completing foreign research traineeships not financed by the Foundation. A report on the mobility of young Polish scientists commissioned by the Foundation in 2008 shows that between 5% and 8% are currently staying abroad. We have set up the HOMING program for the best of them. This program is partially financed from the EEA fund. Researchers returning to Poland within four years of obtaining their PhD can receive a grant as well as money for research.

If applications are comparable in terms of quality, preference is given to applicants not returning to the unit where they prepared their PhD or where they worked previously. This is our way of helping to increase researchers' domestic mobility, which is still limited in Poland. The Polish unit accepting our grant holders not only has to guarantee these researchers employment (including insurance and a pension fund), but also opportunities for working independently on their research projects as outlined in the application and forming its integral part. Thanks to several international agreements the Foundation has signed (with institutions such as the Max Planck Society, the Deutsche Forschungsgemeinschaft, the Alexander von Humboldt Foundation, and many others), grants obtained under the agreements can be additionally increased by sums needed to maintain the beneficiary's scientific contacts with the foreign unit where that person prepared his or her dissertation or completed a traineeship. This program is a bridge program to two others – FOCUS or TEAM. After their first research traineeship, and even more so right after completing their PhD, only very few researchers are ready to start building their own research team. The HOMING program is designed to help them during this transition period.

To win the best also means preventing brain drain and encouraging the best young scientists to return to and work in Poland.

For those who are ready to start building their own research team, we have the FOCUS and TEAM programs. In the FOCUS program, each year the Foundation specifies a group of scientific disciplines in which it wishes to support the emergence of new research teams (this is the only exception to the rule that the Foundation's programs are designed to support researchers from all disciplines). To date these have been topics in which young Polish scientists have achieved international success, for example: mathematical modeling in biology (2006), astrophysics and space technology (2007), biochemistry of tumors (2008). The topic range of these competitions is chosen in such a way that researchers from various fields can apply to take part in the program. Young researchers (no more than 9 years after their PhD) who are accepted receive stipends for themselves

and their co-workers as well as substantial funds for equipment purchases, laboratory modernizations etc. The TEAM program, on the other hand, is available to anyone representing fields from the broad priorities specified by the government – namely Bio, Info, and Techno – without any age restrictions. The restriction as to topics is due to the program being financed by EU structural funds. Winners in this competition receive funds for four-year untaxed stipends for graduate students, PhD students, and postdocs, amounting to 800, 1,000, and 1,500 Euro respectively. The winners also receive a small amount to cover the partial costs of the research work of team members (10,000–20,000 Euro per year per team member). In the case of postdocs, we require the unit where the TEAM program is carried out to cover insurance and pension fund costs.

To make Poland more attractive to people who win a European Research Council Starting Grant, as of 2009 we have started a new program called IDEAS for Poland. Winners who choose Poland as the country where they want to carry out their ERC grant will receive, apart from their regular salary, untaxed stipends of about 3,000 Euro per month in the course of the project and for two years after its completion. In addition, the Foundation will provide them with "flexible" money needed to move from another country or a small amount for equipment necessary to start working on the project in Poland. We believe this will encourage the best researchers to select Poland as the place to complete their outstanding research project in excellent conditions.

One extremely prestigious project of the Foundation, also financed from EU structural funds, is the WELCOME program addressed to Poles returning from other countries or foreigners who are experi-

The data on reforming the system for financing science in Poland and the examples of how the Foundation helps the best scientists working in Poland, allow us to hope that Poland after the transformation will become a country where the best researchers will be able to carry out scientific work, whatever their nationality, the only criterion for evaluating them being the quality of their research.

enced researchers and have headed research teams before. A full grant for five years of research in Poland can amount to as much as 2.5 million Euro, including a stipend for the team's leader making up for the difference between salaries in Poland and in the country where that person worked last.

The Foundation also promotes the scientific achievements of Polish scientists. Each year it awards the FNP Prizes in four disciplines: the humanities and social sciences, life sciences and medicine, exact sciences, and technical sciences. For 17 years now, the FNP Prizes have been recognized as the most prestigious scientific award in Poland.

Thanks to an agreement with the Deutsche Forschungsgemeinschaft, every two years an international panel of judges grants the COPERNICUS Award for scientific achievements which are the result of co-operation between scientists working in Poland and Germany. It is extremely interesting that most Polish teams entering this competition also took part in an Alexander von Humboldt Foundation grant program. Working in association with the Alexander von Humboldt Foundation, our Foundation also provides honorary grants to German scientists to conduct research in Poland. These are awarded to senior researchers from Germany who want to co-operate with a Polish center.

The Foundation's mission is not just to win the best, but also to promote the highest standards of operation. To this end, for several years the Foundation itself and the beneficiaries of our programs have followed a code of conduct and a code of ethics.

Another means of promoting

high quality is to promote the principles of publishing research results in the open access system. For two years now, the Foundation has transferred specific extra funds to beneficiaries of some of its programs to cover the costs of publication in this system, in the world's best available periodicals. We firmly believe that science has a mission to fulfill in society and this is why free access to sources is extremely important for the progress of civilization and culture.

Conclusion

Although it has not presented a number of the Foundation's other initiatives, this outline of the Foundation's activities has shown just how the FNP is following the strategy "to win the best." We do not have any single, universal method of improving the quality of science. We do our best to observe the needs of Polish researchers on a day-to-day basis and adjust our proposals to those needs. The scale of our activities, and being a private institution, allows us to be flexible and quick in making decisions, though unfortunately these do not constitute systemic solutions. We do, however, hope (and this is often the case) that our ideas and projects are adapted and implemented in Polish science by large public agencies which finance research; our role is to show good practice, create standards, and develop ideas which will allow Polish science to develop.

In my firm view, the data on reforming the system for financing science in Poland and the examples of how the Foundation helps the best scientists working in Poland, allow us to hope that Poland after the transformation will become a country where the best researchers will be able to carry out scientific work, whatever their nationality, the only criterion for evaluating them being the quality of their research.



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Making Germany more attractive for young scholars

The question what is needed to make Germany more attractive for (young) researchers has been central in recent debates about reform in the system of science and higher education. It has also been discussed within the Young Academy, an institution established by the Berlin-Brandenburg Academy of Sciences and the German Academy of Sciences Leopoldina to foster interdisciplinary communication among excellent researchers at an early stage in their careers. It is from this experience that the following remarks try to answer the above question.

A preliminary remark concerns the way the question is posed, for it implies a somewhat parochial national perspective that stands at odds with the inherently transnational character that modern science has had since its beginnings within the early modern European universities and academies. Truth is not limited by national borders, and cross-border mobility as an aspect of scientific communication is far from being an anomaly. Put drastically, nation-states may even appear as an obstacle to transnational and global communication. Concrete obstacles for scientific mobility are linked with national structures, including problems with recognition of diploma, with harmonization of career paths, and, not least, the transfer pensions across states. When thinking about the attractiveness of Germany for leading or promising scholars (or any other country, for that matter), policy-makers shouldn't therefore forget their responsibility for creating an institutional environment that facilitates and genuinely encourages mobility and thereby contributes to the advancement of our common knowledge.



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Concrete obstacles for scientific mobility are linked with national structures, including problems with recognition of diploma, with harmonization of career paths, and, not least, the transfer pensions across states.

At the same time, however, there is a legitimate point to national efforts of attracting scholars, not only for reasons of economic competition, but also for intrinsically scientific reasons. Indeed, the diversity of (national) environments may be conceived as an asset to the scientific endeavor, to the extent that such diversity – expressed in intellectual traditions, styles of research, and patterns of education – may in itself contribute to creativity and performance of the entire system of knowledge production. Now, to make Germany more attractive to younger scholars, basically two structural problems



The most important problem concerns career paths which in Germany used to be characterized by lack of early independence of researchers, incalculable risks, and slow processes of recruitment.



need to be addressed next to general pitfalls of heavy administrative obligations, high teaching loads, and non-competitive salaries and the like. The first and most important problem concerns career paths which in Germany used to be characterized by lack of early independence of researchers, incalculable risks, and slow processes of recruitment. In several statements, the Young Academy has criticized these structures and called for greater promotion of tenure-track-positions. The second problem concerns work-life balance, where other countries have found

much better solutions for dual career opportunities, day care support for children, and the like.

Both problems are far from novel and many instruments have been designed to tackle them, ranging from Emmy Noether Programs over Heisenberg professorship to the recent Federal Excellent Initiative. The latter has been particularly interesting, since institutional strategies (Zukunftskonzepte) and excellence clusters have often incorporated tenure-track-positions for younger researchers, dual career support centers, and increased cooperation between universities and other research institutes. For instance, the program "Brain Gain" within the University of Göttingen's institutional strategy has created junior research group leader positions in emerging fields with a view to long-term establishment of new research centers.

So there are good practices within Germany, and yet problems remain. For instance, the mass of doctoral and postdoctoral positions created within the Excellence Initiative is not matched by a corresponding expansion of professorships thus, in the mid-term, acerbating the problem of incalculable risks for young researchers. Furthermore, many reform instruments are – or are at least conceived to be – tailored to the natural sciences, whereas the humanities are still to find their the appropriate mechanisms of attracting international younger scholars. And finally, the reform process of education and research in German universities has in itself created new drawbacks. Thus new public management methods – including rankings, ratings, evaluations, and new modes of resource allocation – have led to attitudes of suspicion and mistrust amongst decision-makers vis-à-vis their own academic staff members, a cultural environment which certainly doesn't make German institutions of higher education more attractive internationally.

Many reform instruments are – or are at least conceived to be – tailored to the natural sciences, whereas the humanities are still to find their the appropriate mechanisms of attracting international younger scholars.

In sum, then, the situation doesn't look as gloomy as ten years ago, since many strategies have already been developed to improve career paths for young researchers in Germany. Yet, there still is a long way to go, indeed a way worth going if we are to keep faithful to the promises and responsibilities of science for a global age.

Communication, cooperation, courage – A funding organization's perspective

One of the most crucial questions to be asked by German research policy-makers these days is: "How can we attract top-notch talents to Germany, and to what extent can we keep our best senior scientists in the country?"

I am sure that several heads of our major research organizations as well as many rectors and presidents of our universities could each come up with several showcases demonstrating their success in winning or maintaining talent for Germany. "Yes...we can!" seems to be their motto just like Barack Obama's. And as success breeds success, there is perhaps a lot to learn from him, in particular with respect to opening up opportunities for change.

From my own involvement in creating programs for the Volkswagen Foundation such as the Junior Research Group Leader scheme in the mid-1990s, and more recently the Lichtenberg Professorships as well as the Dilthey (for the humanities) and the Schumpeter Fellowships (for the social sciences, law,

and economics), I dare to say that for a highly committed researcher it is, of course, his personal salary that matters. However, much more important are ample research funds, a stimulating environment with inspiring colleagues, and a first class access to young doctoral students and postdocs. Moreover, in more and more cases dual career offers also seem to make a great difference.

If we take this seriously, then the future path to success can only consist of a strong move towards establishing a culture of creativity. However, achieving and maintaining such a culture of creativity is not at

The future path to success can only consist of a strong move towards establishing a culture of creativity.

all straightforward. On the contrary, it is full of paradoxes and contradictions. Whilst every institution, not least for securing its own survival, has to insist that its members adhere to its rules and regulations, quality standards, etc., the creation of new ideas ultimately is about breaking the rules, changing perspectives, and about being tolerant to errors made. Epistemologically speaking, radically new ideas can often not be phrased in terms of the initial question, and the openness for "fresh thinking" is not only required by those who produce new ideas, but also by those who are expected to pick them up. The readiness to listen to independent voices inside and outside of one's own institutional network, to encourage risk-taking



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The readiness to listen to independent voices inside and outside of one's own institutional network, to encourage risk-taking in "off the beaten track" areas, and to foster a climate of mutual learning are prerequisites for successfully establishing a true culture of creativity.

in "off the beaten track" areas, and to foster a climate of mutual learning are prerequisites for successfully establishing a true culture of creativity. They in any case have to be complemented by an innovation-friendly human resource policy. Let me just emphasize three "Cs" that also have to be considered:

- **Communication**

Thought-provoking discussions are essential to progress in research. It is an important task of individuals as well as their institutions to strengthen the interaction between researchers by configuring adequate research structures, establishing study groups, and developing research networks. A mere increase in size and diversity is not the answer. On the contrary, it tends to produce a great deal of unproductive heterogeneity, a decrease in interdisciplinary interaction, and can even lead to great losses in innovation-friendly experimentation and flexibility.

- **Cooperation**

In a culture of creativity cooperation should thrive among colleagues, across disciplines, between universities and non-university research-institutions, between universities and funding organisations, and across national borders. New knowledge is usually formed at the boundaries of established fields. Therefore, the interfaces between these areas must be activated so that new pathways can be opened up through cooperation and breakthroughs achieved.

- **Courage**

To foster innovativeness is to appreciate unconventional ways of thinking and to allow for failures. Radically new approaches and transformative research endeavors require different modes of communication, selection, and support (successive grants, long term commitments, and mutual trust). For any funder the challenge remains how to separate the wheat from the chaff without discouraging the most original thinkers and creative researchers.

To sum up, what we need are more research-friendly institutional structures, small to medium-sized research groups, well-connected research communities, attractive career patterns for young researchers, long term funding for risky endeavors, more "creative spaces" within large grants, and mutual risk-taking instead of risk avoidance. Many challenges can only be met if we take a long view. We must be prepared to exercise judgement and to make long-term commitments whilst maintaining the flexibility to respond to new challenges. There is no recipe, nor a master plan that can be copied and implemented straightaway; it is rather a process of creative adaptation to the local environment that makes the difference. To put it in the words of Sir Winston Churchill: "It's not enough that we do our best; sometimes we have to do what's required."

Strategies to make Germany internationally more attractive

Exchange of scientists is essential for scientific progress; therefore, we have to accept that there has to be both a loss and a gain of the best brains. Mobility and exchange has been at the heart of science since historic times. Only with the emergence of nation states and public funding of science, research was supposed to serve national interests.

The competition for the best brains means that we have to position ourselves on the global market and this is a market of scarce resources. Within Europe the competition has already produced an imbalance and a brain drain from East to West. In the long run this will affect all of Europe negatively and as yet we do not have any concept to prevent this development.

Positive examples: Who was successful and why?

Good results in recruiting excellent scientists have been achieved by Max Planck Institutes and similar institutions in Germany. These institutes have a good reputation and it is a positive mark on the CV to have worked at a Max Planck Institute. They provide good infrastructure and equipment, therefore little effort has to be spent to build up the necessary environment for the research. Generally a good financial basic funding is given; this allows relative freedom of research independent of external funds. This is a necessary condition for creative and truly innovative science. Members of MPI have little teaching obligations and other administrative duties, which adds to their post's attractiveness.



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Where are the problems?

General obstacles are well known. They mainly seem to trouble universities as these have little flexibility to offer competitive conditions. Universities generally have an insufficient basic funding and equipment, thus too much effort has to be spent to build up the environment for successful research. Scientists in turn are too dependent on third party funding which restricts the freedom of research and costs a lot of time. The career options for postdocs are unclear. A high teaching load and much administrative work are very common. Last but not least the salaries for scientists are not competitive (see below). Those universities successful in the Excellence Initiative were able to secure funds to offer better conditions and to attract excellent scientists from abroad. The Initiative has raised the hopes of young scientists. However, their future careers remain unclear as there are no concepts how to keep these excellent scientists after the termination

The general conditions for research in Germany are fairly good in comparison to other nations. However, new approaches to internationalization that go beyond attracting top scientists to Germany should also be considered.

of Excellence Initiative funding. Scientists coming to Germany with their families from abroad are offered insufficient child care facilities or international schools, and there are only very few employment options for spouses. Dual career programs would be a help, but they are not well developed yet.

Salaries

One of the biggest obstacles for winning the best scientists is the insufficient flexibility in the salaries. Very often it is not possible to offer a competitive salary to the scientist in question that matches the offers from universities in the USA, in Switzerland, or Asia. In principle the W-salary scale allows the flexibility to offer top remuneration, but the "Vergaberahmen" puts a tight limit on the level of funding and the number of top scientists that can be afforded. It is therefore one of the key demands to abolish the "Vergaberahmen" for top level scientists. A big problem is also presented by comparatively low postdoc salaries that cannot be raised by supplementary payments (Leistungszulagen). In conjunction with the lack of career opportunities, this situation does not attract young scientists to Germany, particularly if they have offers from universities abroad. Finally, transfer of pensions and social security claims between countries is a problem. It is one of the major obstacles to senior scientist's mobility and needs to be solved urgently. There are already a number of good attempts to tackle the identified problems. The Humboldt professorships are a step to win high profile scientists from abroad. Some institutions have found innovative ways to circumvent the "Vergaberahmen." Career pathways for young scientists are being developed in some places. The "Welcome Centers" are a great help for foreign colleagues and their families to find their way through the German jungle of administration. Dual career

options are increasingly being installed. However, all these promising activities are sporadic, unconnected and different in every federal state and in every institution. It takes more time to develop them and we need to do this carefully and with an eye to international standards.

Closing Remarks

Despite the talk about low salaries in Germany, one has to be aware of the fact that scientists are intrinsically driven by interest in excellent science. When they find good conditions to carry out their research, it will be their strongest motive to join a certain institution. Excellent colleagues and good infrastructure are very persuasive.

New approaches to internationalization that go beyond attracting top scientists to Germany should also be considered.

The general conditions for research in Germany are fairly good in comparison to other nations. The Excellence Initiative has helped universities to provide attractive research conditions. However, in some respects German universities are still not competitive on the international market and not professional enough. New approaches to internationalization that go beyond attracting top scientists to Germany should therefore also be considered. It would concern the role of Germany as an architect of international processes and structures. For instance, development of joint appointments, joint institutes between international partners etc. may be promoted. A more internationally oriented German science policy would be more attractive to international scientists. We have to look beyond Germany and have to integrate a much more international orientation in our concepts in order to influence the development of global science.



Strategies to win the best at the start of an independent research career

Observations of a Sofja Kovalevskaja awardee supported by the Alexander von Humboldt Foundation from 2001 to 2004 to build up an independent research group while rejoining the German research area.

The major key to gain, to regain, or also to keep talented young research scientists at the transition between postdoc and independent group leader positions is the availability of a high quality research environment.

What defines a suitable research environment for a young scientist?

1 Funding

Salary: At this point in their career scientists have not only invested a significant part of their life time into their profession but by now may also raise a young family. Thus, salaries have to be internationally competitive: They should adequately honor professional expertise (and mirror the extra mile these talented researchers often have already gone) but also comfortably accommodate living costs – allowing the necessary external support for family matters.

Research: In particular in the life sciences, independence requires not only funding for the PI position, but depends on funding for additional staff (technician, PhD positions), equipment, consumables for re-



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search and travel. Some funding programs – for example those provided by the Humboldt Foundation, but also by others, now allow the PI a maximum of flexibility in allocating funds to different cost categories with a minimum of administration.

The major key to gain, regain, and also keep talented young research scientists at the transition between postdoc and independent group leader positions is the availability of a high quality research environment.

2 Research institutes

An ideal scientific environment provides adequate research infrastructure, up-to-date technical facilities secured and staffed by core funding, but, even more importantly, it provides a stimulating environment of motivated like-minded fellow

scientists. At the same time the young PI is supported by a pragmatic and scientist-friendly administrative department that is, for example, prepared to negotiate international employment contracts.



3 Mentoring

Although trained and independent in his or her research, a young PI can significantly profit from experienced scientists around: Discussions may not only challenge scientific, strategic, or interdisciplinary issues. Some valuable advice may also be given on matters of project and personal management, leadership skills, teaching as well as on networking activities.

Why should or shouldn't a young scientist come to Germany?

Germany hosts groups if not entire institutes of outstanding international rep-

utation covering a variety of research areas in the life sciences and engineering, and of at least equal quality in the humanities and area studies. As a further plus, an increasing number of independent group leader positions are now available, allowing the young scientist in general a five-year period for establishing an independent research group. Also, significant third part funding from multiple sources and networking opportunities exist in the German research system (e.g., DFG, several federal and state ministries, public and private foundations and within joint consortia at the EU level) that would also guarantee follow-up support. Importantly, success rates for grant proposals can be astonishingly high in comparison with the international situation.

However, on the minus side, career perspectives in Germany for young scientists are far from clear and planning security simply does not exist. The W1 junior professorship, once celebrated as the solution towards an early independent research career, often proved the

least predictable: Throughout Germany, "W1" may significantly vary in concept. On the one hand, ideally, it may be a fully equipped, well funded and staffed independent PI position with a true tenure option for a full professorship position afterwards and selected in an open international competition. On the other hand, in its extreme, it may be just a follow-up "job" dependent on a full professor (for example the previous supervisor) without any further financial support and without tenure option.

Career perspectives in Germany for young scientists are far from clear and planning security simply does not exist.

Social structures in terms of child care are under significant improvement in both research institutes and universities, and this is clearly important. However, a major downside is that even today the German research system is hardly able (and often not even willing) to accommodate dual-career couples with equally qualified and independent partners. Occasionally solutions may be found at the young scientist level at research institutes, but when it comes to follow-up permanent positions, the situation continues to be bad.

How not to lose the best

At universities students with a promising talent for science are first seen and identified. This provides the unique opportunity for an early encouragement and support towards a career in science. And while this in the first place may include a recommendation to go abroad for a period of time, there is justified hope that the German research system with its in part excellent research facilities and multiple funding opportunities will be able to regain back the best.

Strategies to win the best international research talents

I was asked to comment on what is needed to make Germany internationally more attractive to excellent (young) researchers? As many of the contributions deal with more formal and institutional aspects of this question, I decided to provide one personal case history: why I came to Germany and stayed there. I don't know if I count as excellent, but I think that at least some of the factors that led me to make my scientific career in Germany are relevant for other young researchers, excellent or otherwise.

I grew up and studied in Britain, and came to Germany in 1978 at the age of 25, immediately after completing my PhD. In the last year of my PhD I applied, in parallel, to several labs around the world. One of these was run by Hans W. Heldt, at that time a Privatdozent in the Institute für Physiologische Chemie at the LMU in Munich. He offered me a postdoc position, and I took it. Why? Because in the last year of my studies and during my PhD, I increasingly felt that Hans's group was doing the most technically rigorous and intellectually exciting work in the area I wanted to continue my research in – photosynthetic carbon metabolism. I guess it helped that I like beer, and mountain climbing, which made Munich an interesting place to live, but the decisive factor was the absolute excellence of the science. Once I started working in the group, I was further attracted by the way that responsibility and decisions were delegated, and the young scientists were consulted about the scientific direction and strategy. These two things – scientific excellence and recognition and consultation with young scientists are for me the absolute precondition for attracting young



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scientists. I stayed with Hans for eight years, even after he moved to Göttingen where there were no mountains and the local beer was markedly inferior. In this time I turned down permanent positions back home, because I preferred to remain in this excellent intellectual environment.

Why did I stay permanently in Germany? I think there were two further factors, in addition to the impression made on me by the lab where I did my extended postdoc. First the recognition and strong support provided to me (and other colleagues of my generation) by several established German professors in plant physiology and biochemistry. The second was more institutional. At the time when I was starting to realize (also under the prompting of the German Employment law) that I would need to get a permanent position and set up my own lab, and was looking at jobs in Britain and the USA, a specific program was established in Germany to promote young scientists – the so-called Fiebiger program. This created a set of new professors, in advance of the retirement of older ones. I was lucky enough to be selected for a Fiebiger Professor in Plant Biochemistry in the Institute for Plant Physiology in Bayreuth University, run by Erwin Beck.



Thus, the key factors that attracted me to Germany and kept me there this far were: the excellence of the science in the lab, the open environment in the lab, the personal support from the community, and luck that I was able to benefit from a far-sighted program designed to provide permanent positions to young scientists. At this stage, the story stops, as I was 33 and no longer young.



Turning now to the viewpoint of an old guy, who subsequently spent 6 years running a group in Bayreuth with up to 15 people, 10 years running an Institute at Heidelberg University, and 8 years running a Department in a Max Planck Institute. Throughout this time, I have

had a very international group, with over half of the postdocs and about half of the PhD students being non-German. What can be done to help them. I still believe strongly: first, first and first again, science. However, there is also a series of organizational things. If you are running a group with multiple nationalities, then a lingua franca is needed and, at this time, it is English. Hold the lectures and seminars in English and, if necessary, provide in-work training for non-academic staff. All information should be given in German and English, including (this sounds funny, but it isn't if people can't understand them) all safety instructions and all instructions for use of apparatus. Make sure there are people in the institute who actively help them in interactions with German bureaucracy. And give young scientists independence.

Formal and institutional aspects are also important, especially in my view the ones that affect how you work. German universities have been chronically understaffed and under-funded for decades. They only function because of unpaid work from students and non-tenured staff. This is something that politicians must be constantly re-

mindful of, in the hope that they will stop trying to paper over cracks in an underfinanced system. More permanent staff are needed, plus the ability to get rid of the ones who fail to deliver in research, teaching and administration. A pipe-dream of course. Then there is the running debate on the organization of the study system (Diplom?; BA, Masters?) and career structure (tenure-track?). Reform of the structure of the Studium is certainly needed, and could open up more flexibility to attract students from abroad, for example, by allowing entry at the Masters level. But is the move from the old system

German universities have been chronically understaffed and underfunded for decades.

of Diplom-PhD to Bachelor-Masters-PhD leading to increased regulation and duration of the Studium? And I wonder if the best solution is to tack Anglo-Saxon sounding programs (especially a short Bachelor) onto a German school system that does not allow specialization. In Scotland, where the school system is closer to that of continental Europe, a Bachelor takes 4 years. The American system also has some very attractive elements; here after a rather general school education and completing their Bachelor, students enter a graduate school that lasts 5-6 years and contains a mix of study and research. I also worry that adding a tenure-track system (like junior professors) in parallel with the old career structure is not an optimal solution – if you want to move to tenure tack, then switch completely, and establish unequivocal and transparent procedures for the evaluation before any tenure-track positions are filled. If you allow them to mix, bad money usually drives out good money.

Strategies to win the best: Observations and recommendations

Whether it is the "Pact for Higher Education," the "Excellence Initiative," or the "Pact for Research and Innovation" – much has been done to enhance the quality, competitiveness, and worldwide recognition of Germany's research and higher-education system in the past years. Yet Germany is not alone in its efforts: Highly qualified people are sought after and courted all over the world. Research Chairs in Canada and South Africa, Discovery funds in Australia, A*Star awards in Singapore – countries worldwide are competing to attract and retain the world's most accomplished and promising minds. What are the lessons to be learned from such national programs and initiatives? What is needed to make Germany internationally more attractive to excellent researchers? How can funding organizations in general and the promotion of international exchange in particular strengthen Germany's position in the future global knowledge society?

While reports from different countries and organizations underlined the diversity of academic systems and strategies to win the world's brightest minds, they also identified common developments and challenges. Statements given by experts with different backgrounds in science, science policy, and management stressed specific questions, issues of concern, and fields for improvement. The following 15 points summarize general observations and recommendations the International Advisory Board has drawn from the discussions during its second Forum on the Internationalization of Sciences and Humanities. Addressing the Humboldt Foundation itself as well as its partners in science, science management, and research policy in Germany and beyond, the Board suggests a threefold strategy, aiming at the international, national, and institutional levels, to ensure that Germany remains a top address for the international academic elite.

1. An international strategy to strengthen Germany's role in the global knowledge society

With its "Strategy for Internationalization of Science and Research," the "Excellence Initiative," and the "Research and Academic Relations Initiative" the Federal Government of Germany has enhanced the attractiveness and international competitiveness of the German higher education and research system. Yet German universities and research institutions are facing ever stiffer competition in the global contest for academic talent and cutting-edge researchers. With a new geography of science and innovation emerging, Germany has to develop an international strategy to strengthen Germany's role in the global knowledge society. Combining foreign cultural policy instruments with international science and research policy instruments, Germany must develop a strategy that is ambitious and self-confident, competitive, and visible. In particular, the International Advisory Board suggests to:

1) develop attractive and competitive instruments to make brain circulation possible: In the international contest for the most highly motivated students, the most talented Ph.D. candidates, the most ambitious post-docs, and the most renowned international scholars, Germany has to be more competitive, and get better at competing. For this reason, financially attractive stipends have to be provided that can keep up with international competitive offers. As the best students follow the stars of their respective disciplines, internationally visible landmark awards for top-notch international researchers, such as the Alexander von Humboldt Professorship, are necessary. Thereby, an academic network of excellence for Germany can be created. Yet it is not only necessary to offer perspectives in German academia to outstanding international researchers, but to German scientists wishing to return to – or, in fact, to stay in – Germany as well.

2) establish a transnational research environment by making joint appointments possible: As an instrument of "brain sharing" rather than as an instrument of "brain gain," joint appointments would allow universities and research institutions in different countries to benefit from the presence of a top researcher for a certain period of time. A model of this kind would not only facilitate the exchange of knowledge and ideas, but could also become especially interesting in conjunction with the abolition of age limits: it would allow excellent senior researchers to continue working and mentoring younger researchers in different countries as well as supporting them to build up international networks, with two funding institutions benefiting from their experience and reputation. Advantages of joint appointments, therefore, reach from financing to graduate and postgraduate teaching, and, through "brain sharing," they might help to establish transnational "cultures of creativity."

3) support international academic cooperation and exchange at the individual as well as institutional level by coordinating career structures: International mobility and the possibility to build up international scientific networks is an important factor for the personal and scientific development of young researchers in particular. Just as scientific independence at an early stage, international mobility is essential for the advancement of science, which increasingly depends on the international exchange of knowledge and ideas. Therefore, career structures need to be coordinated and obstacles for mobility such as the non-transferability of pensions need to be removed. The establishment of a global postdoctoral system, which encourages mobility and independence among young researchers, facilitates the circulation of knowledge and lays the foundation for lasting international partnerships and research collaborations. It is necessary, therefore, to provide postdoctoral researchers with visas that allow them to participate in their groups' extensive research collaborations worldwide, offer them tenure track options, and provide dual career support.

4) enhance the international image of the German higher education and research system: The Board recommends that suitable marketing instruments be developed to promote Germany's role as a major centre of education, research, and innovation. Boosting international academic exchange and research collaboration and opening up new fields of innovative potential, specifically targeted, international marketing measures should aim at expanding and consolidate the cooperation with the world's top-notch researchers. In the framework of the Federal Government's Strategy for "Internationalization of Science and Research" first measures have been taken to highlight Germany's appeal to the global academic community. Future strategies must lead to the identification of the best available knowledge, optimum structures, and the most suitable processes.

5) internationalize social security benefits: Internationally mobile researchers often have to accept major disadvantages or financial losses with regard to pension rights. On a European level at the very least, basic conditions for transferring social security benefits must be put in place. An equalization fund could temporarily allow science organizations or individual universities to compensate for the disadvantages.

2. A national strategy and an explicit commitment to strengthen the German research and higher education system

The contest for the most accomplished and promising international researchers can only be as successful as the German higher education and research system becomes more attractive itself. While joint appointments ensure that academic exchange does not suffer as a result of the world-wide competition for the brightest minds, enabling several countries to profit from "brain sharing," creative solutions and new ideas are called for in the national higher education and research landscape as well. It is necessary that Germany makes a strong political commitment to higher education and develops a clear national strategy to enhance its science and research system. In particular, the International Advisory Board of the Alexander von Humboldt Foundation recommends to:

1) create more jobs for scientists and scholars: On average, German professors supervise 63 students. This is more than twice as many as the average at top-rank international universities. In order to realize the European Union's Lisbon Targets Germany would have to create 70,000 new research positions. The Pact for Higher Education and the Pact for Research and Innovation provide a financial basis for recruiting young academics. However, the measures are not sufficient and must be augmented in the mid-term.

2) ensure appropriate and internationally competitive remuneration: It must be ensured that international cutting-edge researchers can be offered appropriate and internationally competitive remuneration. This is an essential precondition for ensuring that knowledge transfer via people remains lively and productive. A national special program for appointing eminent academics from abroad might be one way of creating the conditions for attracting internationally renowned cutting-edge researchers.

3) promote early independence by taking risks in financing research: In particular for young researchers it is important to be independent and mobile in order to be able to build up networks and develop scientific creativity. Yet by international comparison, young academics in Germany have less scope for decision-making and action. The freedom and independence of young researchers, however, does not depend of first-class universities. While the system needs to be adapted to the needs of younger researchers and the new demands of academic mobility, funding programs for early, independent research must be strengthened. Especially for researchers at early career stages, procedures should be profiled for research work involving an unknown risk factor. Research funding organizations should therefore also aim at improving local research cultures and environments suitable for young researchers in very concrete ways. Research clusters and institutes of advanced study may provide an example how to combine transnational and local perspectives. The recent "Excellence Initiative" was an important step in this context. Funding organizations should evaluate how their programs and policies fit into a transnational framework.

4) establish tenure track as an option for junior researchers to give academic careers planning certainty: German universities must take measures to plan the career stage between a doctorate and a tenured professorship and make it compatible internationally. On the pattern of the Anglo-Saxon tenure track, clear, qualifying steps should be defined as to which decisions have to be made about the future career at an institution. A stage model of this kind must on all accounts include the option of being appointed to a tenured professorship, albeit in the knowledge that this option is only open to a certain percentage of those who choose to set out on this path.

5) support courage and confidence on the part of funding organizations: The German system provides only few funding opportunities for "truly risky projects," and the social cost of failure is much higher in Germany than elsewhere. Exploring unknown territories and taking risks, however, is part of the very nature of science and research. By promoting incentive and bottom-up structures, funding organizations play a major role in changing research cultures. Through their funding policies, they have to give the impetus to a national strategy for research policy. While providing more rewards for competitive performance and risk-taking, they can also help to decrease bureaucracy and regimentation by making staff appointment schemes and bureaucratic recruiting and appointment procedures more flexible and efficient. Funding opportunities have to be enlarged and funding secured for extended periods of time, to encourage the pursuit of risky, open-ended research and improve long-term career perspectives. Depending on the field, personal funding is even more important than institutional funding. This requires funding organizations to revise their selection processes in order to be able to identify truly excellent researchers.

3. An institutional strategy to allow German universities and research institutions to actively recruit top international academics and promising junior researchers

Active recruitment of top international academics and promising junior researchers is one of the tools used by countries like Denmark, Poland, and South Africa to hold their own countries in the global contest for the best ideas and compete with the United States, which is still the leading science nation in many fields. As well as the race for the highest salaries, the best institutes, and the most expensive world-scale plants, however, there should also be creative new models. The International Advisory Board of the Alexander von Humboldt Foundation therefore calls for an institutional strategy to help German universities and research establishments build up a climate allowing for excellent researchers to concentrate on their research. In particular, it recommends to:

1) professionalize recruitment and appointment procedures: Professional appointment procedures are essential. The recommendations issued by the German Council of Science and Humanities in 2005 present the minimum standards. If international mobility leads to success, it must be duly recognized. Appointment procedures must have an open outcome and be transparent. To this end, commissions charged with appointments must include external or independent expert reviewers. Good academics should be appointed quickly. Internationally respected universities can no longer afford to sometimes take years over appointments, particularly as universities and research establishments now actively have to recruit junior researchers internationally to a much greater extent than they did in the past.

2) dissolve staff appointment schemes and adapt management structures: The most important resource of a university or research institute – its staff – is always a matter for the boss. Hence, university management should take full advantage of current university deregulation and the concomitant gain in autonomy. The way a university or academic field develops may offer an opportunity to reassess the particular emphasis of the respective chair. In each individual case, the relationship between continuity and change must be redetermined in collaboration with those involved within the university but also – if necessary – with colleagues from outside. Rigid staff appointment schemes must make way for flexible appointment options, or be dissolved. Independent junior research group leaders must be put on a par with junior professors within the universities and in collaborations between universities and non-university research establishments. The increased demands being placed on university and institute management must be reflected in their remuneration, which should bear some relation to emoluments for comparable managerial responsibilities in the non-academic sector.

3) offer career support as an advisory and supervisory task of academic managers: Senior academics as well as university and/or institute directors must play an active role in human resources development for their junior researchers. Young scientists and scholars need career advice, and their career paths should be monitored and coordinated. Planning certainty assumes that planning assistance is available, too, in order to find the right path, not only within the science system but also in employment out-

side the science system. Taking mentoring of graduate students into account, teaching and administrative duties should be reduced.

4) increase transparency and create an attractive working environment: As well as job-related conditions, in the global competition for cutting-edge researchers at all stages of their careers the support provided for people and families is decisive. Therefore, in order to provide internationally mobile junior researchers with a fast means of orienting themselves in the German science system, existing information and advice portals should be further developed and supported where researchers can find out how to get further information and take advantage of personal counseling. There is also an urgent need for suitable accommodation for internationally mobile researchers who come to Germany for a restricted period of time, and academic employers in Germany must be put in a position to offer organizational and financial support for removal and relocation. This is already the norm in other countries, especially when top-rank academic personnel are appointed. Moreover, career advice and support for (marital) partners seeking employment as well as so-called dual career advice or support for academic couples is required to attract internationally mobile researchers. Examples from abroad indicate that this does not necessarily mean concrete job offers (which are often difficult to find). Rather, intelligent counseling can satisfy many researchers' needs. In addition, child-care facilities at universities and non-university research institutions must be expanded quickly and extensively – not only, but also for internationally mobile researchers.

5) foster intercultural integration through the promotion of soft factors: Just as the support provided for researchers and their families is decisive for them to work and live in Germany, an attractive working environment always depends on people. As communication is essential both inside and outside of the research institute, the promotion of soft factors such as language skills plays a major role for the creation of a transnational scientific community. Promoting knowledge of the German language would, in a rather concrete way, support international researchers in their everyday lives, working in Germany, and interacting with German society. Yet while language is the door to a culture, research culture inclusive, creating a multilingual scientific community at German universities and research institutions needs to be encouraged as well. Providing international researchers with the necessary resources to acquire German language skills as well as providing academic and non-academic German staff with English language training because English is the lingua franca of the global scientific community, would not only facilitate the cultural integration of international researchers into the German academic community and society. It would also enhance international research collaboration, help create sustainable academic networks of German researchers and scientists and their international partners, and thereby strengthen Germany's position in the global knowledge society. For this purpose, to help the German research landscape become more international, the establishment of "Welcome Centers," offering start-up service for internationally mobile researchers, and of "International Meeting Centers" has to be further supported as well.



NOTES ON CONTRIBUTORS





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Lauritz B. Holm-Nielsen has been Rector of Aarhus University in Denmark since 2005, as well as Vice Chairman of the Danish Rectors' Conference, Vice Chairman of Universities Denmark, Chairman of the Nordic Universities Association and a Member of the Board of the European University Association. He started his career as an academic in botany, and was Dean of the Faculty of Science at the University of Aarhus from 1976 to 1979 – a position he left to take up a professorship in Ecuador. Lauritz B. Holm-Nielsen also spent 12 years from 1993 to 2005 at the World Bank, where he formulated strategies for further education, training, and research, financed these projects, and saw them to fruition in a wide range of emerging countries – most recently Columbia, Chile, and Mexico. He has also published many papers on higher education, science, and technology, innovation, and globalisation. His latest publication (2008) concerns the mobility of talent.



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Matthias Koenig (*1971) is full professor of sociology at the University of Göttingen, Germany. Having studied at the Universities of Hamburg, Princeton (USA), and Marburg and having worked at UNESCO's division of social sciences, Paris, he holds a Master's and a Doctoral degree in sociology from the University of Marburg as well as a Habilitation in sociology from the University of Bamberg. Before joining the University of Göttingen in 2006, Koenig taught at the Universities of Marburg and Bamberg and, as guest professor, at the École Pratique des Hautes Etudes (EPHE-Sorbonne) in Paris. He received several research grants and scholarships, including a DAAD scholarship at the European University Institute, Florence, and a EU Marie Curie fellowship at the Institut des Recherches sur les Sociétés Contemporaines (IRESCO), Paris. He is an elected member of the Young Academy at BBAW/Leopoldina, an associated member of the Groupe Sociétés, Religions, Laïcités (unité mixte de recherche EPHE/CNRS), and member of the scientific advisory board of the Institute for World Society Studies at the University of Bielefeld. He is board member of several international journals and has published widely in the fields of sociological theory, sociology of religion, and human rights.



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Prof. Dr. Karin Lochte (*1952) was appointed director of the Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association in November 2007. In this capacity she has been engaged in advancing important scientific issues in polar research, for example as a delegate to the Scientific Committee on Antarctic Research which she joined in 2008. Karin Lochte is and was a member of many national and international bodies. Since 2004, she has been a member of the Science Council and she was chairperson of the Scientific Commission from 2006 to 2008. She has also chaired the Senate Commission on Oceanography since 2004.

Karin Lochte worked at the Alfred Wegener Institute earlier in her career, conducting research on the bacterial colonisation and activity of bacteria in sea ice from 1990 to 1994. From 1995 to 2007, she taught Biological Marine Science at Kiel and Rostock universities and was head of the research unit for Biological Oceanography at the Leibniz Institute of Marine Sciences from 2000 to 2007; she is currently a member of the institute's Board of Governors. From 1995 to 2000, she was in charge of the Biological Oceanography Department at the Institute for Baltic Sea Research in Warnemünde. Karin Lochte completed her professorial qualifications (Habilitation) at Bremen University in 1994. From 1985 to 1990, she conducted research in Deep Sea Microbiology at Kiel University's Institute of Marine Sciences. Karin Lochte did her doctorate at the University College of North Wales in the United Kingdom in 1984.



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Dr. van Jaarsveld is the Vice President of the NRF and MD of Research and Innovation Support and Advancement. His distinguished career in research, teaching, and leadership include academic and management positions at the Universities of Stellenbosch and Pretoria, and the position of Adjunct Professor: Environmental Studies Programme at Dartmouth College, USA. He is a member of several professional and academic organizations and associations and has published extensively both nationally and internationally in his field of specialisation.

His research interests include conservation planning and bio-complexity and he has published over 100 primary papers, including highly cited works in Science and Nature.



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Tina Romeis studied Biochemistry at the Eberhard Karls University in Tübingen, Germany, and obtained her Ph.D. in 1993 for her work at the Max Planck Institute for Developmental Biology on the chemistry and biosynthesis of the bacterial cell wall. During her postdoc at the Ludwig Maximilians University in Munich Tina Romeis changed into the field of plant pathology by working on developmental aspects of a maize pathogenic fungus. In 1997 she moved, as an EMBO fellow, to the Sainsbury Laboratory at the John-Innes Centre in Norwich, UK, to investigate the plant defence against pathogens. There, she identified a novel class of protein kinases to be involved in early signal transduction pathways active in responses to biotic and abiotic stress. In 2001 Tina Romeis was awarded the Sofja Kovalevskaja Prize from the Humboldt Foundation which enabled her to return to Germany and to set up an independent research group at the Max Planck Institute for Plant Breeding Research in Cologne. Since October 2004 Tina Romeis is full professor (C4) and chair for plant biochemistry at the Free University in Berlin.



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Mark Stitt (*1953) grew up in Stafford, UK. He gained a BA in Natural Sciences at the University of Cambridge, UK, where he also completed his PhD. In 1978 he moved to Germany, working first as a PostDoc in the LMU Munich, and then as an Assistant at the University of Goettingen. He was appointed to an Associate "Fiebiger" Professor for Plant Biochemistry at University of Bayreuth in 1986. In 1991 he moved to be Full Professor at the University of Heidelberg, where he was also Director of the Botany Institute. He has spent 4 periods working in the USA, two at the University of Berkeley, California, in the 1980s and two in Stanford, California, in the 1990s.

In 2000, he was appointed Director of the 2nd Department (Metabolic Networks) in the Max Planck Institute of Molecular Plant Physiology (MPIMP) in Golm. The MPIMP was founded in 1995 and is located just outside Potsdam, about 60 kilometres southwest of Berlin. Its mission is to carry out a system orientated research that links physiology, molecular biology, genetics, chemistry, and physics, in order to understand the synthesis and regulation of metabolites that are important for storage, transport, adaptation, and signalling in plants. In 2008 he was awarded an Honorary Doctorate by the University of Umea, Sweden.



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Maciej Zylisz (*1953) has been President and Executive Director of the Foundation for Polish Science since September 2005. He obtained his doctoral degree in biochemistry from the University of Gdansk in 1979. After three years of postdoc training in the USA, he was qualified as an assistant professor of molecular biology in 1986. He received professorial rank in 1992. From 1980 until 1999 he was an associate of Gdansk University, and from 1993 until 1994 visiting professor at the Utah University Institute of Oncology in the U.S. Since 1999 he has been Head of the Molecular Biology Department of the International Institute of Molecular and Cell Biology in Warsaw.

Professor Zylisz is a member of the Polish Academy of Sciences, the European Molecular Biology Organisation, EMBO (since 2000), and the Polish Academy of Arts and Sciences and Academia Europaea (since 2001). He was a member of the EMBO Council and was a representative of Poland in the EMBC and the ESF (Standing Committee of the Life Sciences). During the years 1997-2004 Professor Zylisz was first a member and then a chairman of the Biology, Earth Sciences and Environmental Protection Group of the State Committee for Scientific Research. In 2000/01 he was also a Chairman of the Basic Research Section of the Committee. Since 2008 he has been a chairman of the Molecular and Structural Biology and Biochemistry Panel at the European Research Council. In 2007 Professor Zylisz was awarded the title of Doctor Honoris Causa by Wroclaw University.



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Dr. Wilhelm Krull has been Secretary General of the Volkswagen Foundation since 1996. He has held leading positions with the Wissenschaftsrat (German Council of Science and Humanities) and the Max Planck Society. Besides his professional activities in science policy as well as in the promotion and funding of research, he serves on numerous national, foreign, and international committees and boards.

At present he is the Chairman of the Board of the Foundation Georg-August-Universität Göttingen, and a member of the Governing Board of the Central European University in Budapest, of the Scientific Advisory Commission of the State of Lower Saxony and of the Board of Regents of several Max Planck Institutes.

In 2005, he chaired the founding committee for the new Academy of the Sciences in Hamburg. Together with a commission of leading personalities in the German higher education system, in the same year he formulated a framework for a future-oriented higher education and research system in Germany.



The International Advisory Board of the Alexander von Humboldt Foundation

The Alexander von Humboldt Foundation is a non-profit foundation established by the Federal Republic of Germany for the promotion of international research cooperation. It enables highly qualified scholars not resident in Germany to spend extended periods of research in Germany and promotes the ensuing academic contacts. The Humboldt Foundation promotes an active world-wide network of scholars. Individual sponsorship during periods spent in Germany and longstanding follow-up contacts have been hallmarks of the foundation's work since 1953.

The International Advisory Board of the Alexander von Humboldt Foundation is an independent, international expert group which meets once a year to discuss strategic issues relating to the global mobility of researchers and the internationalization of research. The Board provides a forum for debate on global developments in science and academia, science policy, and science administration.

Chairs

Helmut Schwarz is Professor of Organic Chemistry at the Technische Universität Berlin and President of the Humboldt Foundation. He has worked as visiting professor at a number of research institutions abroad and has served as Vice President of the Berlin-Brandenburg Academy of Sciences and Humanities, Vice President of the German Research Foundation (DFG), Chairman of the Scientific Advisory Board of the German-Israeli Research Programme, and Vice Chairman of the Board of Directors of the Fonds der Chemischen Industrie.

Kenneth Prewitt is Carnegie Professor of Public Affairs at Columbia University and Vice President for Global Initiatives. He has held appointments as Dean of the New School University's Graduate Faculty of Political and Social Science, as Director of the U.S. Census Bureau, President of the Social Science Research Council, and Senior Vice President of the Rockefeller Foundation. He has served on advisory boards to the World Bank, the World Health Organization, UNESCO and numerous other U.S. and international organizations.

Members

Alexander Borst is Director of the Max Planck Institute of Neurobiology in Martinsried. Before, he served as a Junior Research Group Leader at the Friedrich-Miescher-Laboratory (FML) of the Max Planck Society in Tübingen and held a faculty position at the Department of Environmental Science, Policy & Management (ESPM) at the University of California, Berkeley.

Angelos Chaniotis is Senior Research Fellow at All Souls College of the University of Oxford. He has held positions as Professor of Classics at New York University and as Professor of Ancient History and Vice Rector for International Affairs at the University of Heidelberg. He served as representative of the University of Heidelberg in the League of European Research Universities and is a member of the Advisory Board of the Helsinki Collegium for Advanced Study.

Rita Colwell is Distinguished University Professor of Environmental Health Sciences both at the University of Maryland at College Park and Johns Hopkins University Bloomberg School of Public Health and Chairman of Canon US Life Sciences, Inc. She served as the 11th Director of the National Science Foundation and has held many advisory positions in the U.S. government, nonprofit science policy organizations, and private foundations, as well as in the international scientific research community.

Daniel Fallon retired from Carnegie Corporation of New York in 2008, where he had been chair of the education division since 2000. Working as an independent consultant in the arena of education reform, he holds continuing appointments as Professor of Psychology, Emeritus, and Professor of Public Affairs, Emeritus, at the University of Maryland at College Park, where he also served as Vice President for Academic Affairs and Provost. He is a founding member of the Board of Trustees (Stiftungsrat) for Hildesheim University and also a founding member of the Board of Trustees (Hochschulrat) for the Ruhr University in Bochum.

Gerhard Haerendel is Director emeritus of the Max Planck Institute for Extraterrestrial Physics in Garching and Distinguished Professor of Space Physics at the Jacobs University Bremen. He held appointments as Honorarprofessor at the Technische Universität Braunschweig and Visiting Professor at the Universities of Iowa and California, Berkeley. He has served on numerous advisory committees and boards and was Vice President and Founding Dean of the School of Engineering and Science of the International University Bremen (Jacobs University).

John Hood became Vice Chancellor of Oxford University in October 2004. He gained his PhD in Engineering from Auckland and Master of Philosophy from Oxford, where he was a Rhodes Scholar. He was previously Vice Chancellor of the University of Auckland. Previously he held senior positions at one of New Zealand's largest companies. His interests in sport and education involve a wide range of roles, from board memberships to committee chairmanship.

Konrad H. Jarausch is Senior Fellow of the Zentrum für Zeithistorische Forschung in Potsdam and Lurcy Professor of European Civilization at the University of North Carolina, Chapel Hill. He has written or edited three dozen books on German and European history, most recently "After Hitler: Recivilizing Germans" (2006) and "Conflicted Memories: Europeanizing Contemporary Histories" (2007).

Katharina Kohse-Höinghaus is Professor of Chemistry at Bielefeld University, President of the German Bunsen Society, member of the Senate of the German Research Foundation (DFG) and of the Board of Trustees of the Volkswagen Foundation. She has held positions as Senior Researcher and Group Leader with the German Aerospace Research Center (DLR) in Stuttgart and was awarded a Heisenberg fellowship. Her international experience includes periods in the USA and France. She is also a Fellow of the International Union of Pure and Applied Chemistry and a member of the Board of Directors of the International Combustion Institute.

Wilhelm Krull is Secretary General of the Volkswagen Foundation, one of the largest private science funding organizations in Germany. He has held leading positions with the Wissenschaftsrat and Max Planck Society and serves on numerous national, foreign, and international committees and boards, including the Governing Boards of the Universities of Göttingen and Budapest, the Scientific Advisory Commission of the State of Lower Saxony, and of the Board of Regents of several Max Planck Institutes.

Ekhard K.H. Salje has held positions as Professor of Physics, Mineral Physics and Crystallography at the Universities of Hannover, Paris, and Cambridge and was Head of the Department of Earth Sciences and President of Clare Hall, a Cambridge College. He has served as advisor to the Wissenschaftsrat (German Council of Science and Humanities) and to the Deutsche Forschungsgemeinschaft (German Research Foundation) on university reform. As President of the Alexander von Humboldt Association of the U.K. he built strong links with Germany and fostered the academic exchange between the two countries. He has held visiting professorships in Japan, Spain, Germany, and France and is currently Ulam scholar in the U.S. (Los Alamos).

Konrad Samwer is Professor of Physics at the University of Göttingen and Vice President of the German Research Foundation (DFG). He has held positions as Professor of Physics and Dean of the Faculty of Mathematics and Natural Sciences at the University of Augsburg and has served on numerous selection and steering committees.

George E. Walker is Professor of Physics and Senior Vice President for Research Development and Graduate Education, and Dean of the University Graduate School at Florida International University. He has held appointments as Professor of Physics, Vice President for Research, and Dean of the Graduate School at Indiana University, and has served as Chair of the Council of Graduate Schools, President of the Association of Graduate Schools of the Association of American Universities (AAU), and Chair of the Council on Research, Policy and Graduate Education of the National Association of State Universities and Land-Grant Colleges (NASULGC). He directed "The Carnegie Initiative on the Doctorate" while a Senior Scholar at the Carnegie Foundation for the Advancement of Teaching.

William A. Wulf is a University Professor and AT&T Professor of Engineering at the University of Virginia. He was formerly the President of the National Academy of Engineering, an Assistant Director of the National Science Foundation, Founder and CEO of Tartan Laboratories Inc., and a Professor of Computer Science at Carnegie Mellon University.

History and Mission

The International Advisory Board was established in 2007 in response to an increasing demand for expertise in questions concerning the internationalization of science and scholarship. It is successor to the Advisory Board of the Foundation's Transatlantic Science and Humanities Program (TSHP), which was established in 2001 with the aim of creating a binational network of experienced leaders from German and North American academia, science administration, and science policy. The International Advisory Board supports the Foundation's strategic planning. As an independent expert group, the International Advisory Board supports the Foundation's strategic planning.

Forum on the Internationalization of Sciences and Humanities

The International Advisory Board hosts an annual Forum on the Internationalization of Sciences and Humanities, opening its discussions to a select group of leading international experts and top management officials representing the Foundation's partner organizations. Each forum provides an opportunity for eminent international experts to hold an open exchange of views in a private setting. Important minutes of the proceedings and recommendations are published for the benefit of a wider audience. The Board's first Forum convened in Washington, DC, and was dedicated to the topic "Postdoctoral Career Paths: International Perspectives" and featured expert reports from the OECD and the European Union, from the United States, Portugal, Germany, Great Britain, China, and India.

Forum Participants 2008

Albrecht, Ulrike | Director Strategy Department, Alexander von Humboldt Foundation, Bonn

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Fallon, Daniel | President, American Friends of the Alexander von Humboldt Foundation, Washington, DC, USA

Fisher, Cathleen S. | Executive Director, American Friends of the Alexander von Humboldt Foundation, Washington, DC, USA

Freund, Hans-Joachim | Director, Fritz-Haber Institute of the Max Planck Society, Berlin

Götz, Thomas | Deputy Director-General, Research and Academics Relations Policy, Federal Foreign Office, Berlin

Grathwol, Robert | American Friends of the Alexander von Humboldt Foundation, Washington, DC, USA

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Gruhlich, Rainer | Program Director Strategic Planning/External Relations, Alexander von Humboldt Foundation, Bonn

Hesse, Thomas | Director Selection Department, Alexander von Humboldt Foundation, Bonn

Holm-Nielsen, Lauritz | Rector, Aarhus University

Jaarsveld, Albert van | Vice President and MD RISA, South Africa

Koenig, Eric | American Friends of the Alexander von Humboldt Foundation, Washington, DC, USA

Koenig, Matthias | Professor of Sociology, University of Göttingen

Kuo, Peggy | Chief Hearing Officer, New York Stock Exchange, New York, NY, USA

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Schütte, Georg | Secretary General, Alexander von Humboldt Foundation, Bonn

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Zylicz, Maciej | President – Executive Director, Foundation for Polish Science, Warsaw

