

Final Minutes

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How Fit Is Our Research For Global Competition?

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Introduction

For the past five years, the Science and Research Programme Area of the Robert Bosch Foundation has invited a small number of highranking stakeholders – consisting mainly of representatives from the sciences, research management, science policy and media – to attend the **Berlin Science and Policy Debate** and discuss current issues affecting our research systems. During these intensive sessions, experts exchange ideas and views and seek solutions to pressing problems in research today.

In its fifth meeting, the Berlin Science and Policy Debate addressed the question of competitiveness of the European research system compared to the US and Asia, especially in countries such as China. No less than 21 high-ranking decision-makers met in the historic *Berlin-Brandenburgische Akademie der Wissenschaften* and engaged in a lively discussion that highlighted the topic from different points of view. The group varied in its constitution, both geographically and with respect to their area of expertise and their role in the research system. Represented in this group were large and small European countries, universities, research funding and research performing organisations, policy making bodies and foundations. The discussion was moderated by a science journalist. All participants' names can be found at the end of this document.

The Science and Policy Debate was structured in three sessions, each touching upon important aspects of the main question: **How fit is European research for global competition?**

Referring to a quote by former Commissioner for Research, Janez Potočnik, who called for a “Team Europe in research”, the discussants agreed that all EU Member States' contribution is needed to secure and guarantee competitiveness. The creation of the European Research Council (ERC) is a fine example of what the mobilisation of the research community can achieve, although many other factors had to come together to actually realize its establishment. Through this body, the ‘Team Europe’ has gained momentum and has attracted the attention of decision makers. The question is how to sustain this momentum and channel it towards an improvement of existing structures and processes as well as towards securing the necessary financial means for the coming years. At the same time, how can the scientific community contribute to this process from within, by becoming more flexible and modern and by adapting to new challenges?

The panel of experts extensively discussed these questions in three thematic sessions: The first session focused on the selection instruments for highly promising, yet risky scientific projects. The discussion revolved around methods and practices of peer review, its positive and negative aspects as well as its potential in the future. The second session looked at the human resources available in research, how to attract the best scientists and make use of their talent, but also how to encourage women to stay in science. The third session deliberated the ideal balance between co-ordination and competitiveness. Finally, in the general discussion participants made an effort to assess the existing research system in Europe with regard to its quality, efficiency and flexibility.

Opening Statement

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The Science and Policy Debate began with a statement by Helga Nowotny, President of the European Research Council (ERC). Professor Nowotny referred to a quote by Louis Pasteur, which beautifully summed up her argument:

“In the field of observation, chance only favours the prepared mind.”

What kind of ‘preparedness’ does science need and how prepared is the scientific community to identify excellence? On the one hand, scientists need to be able to draw their attention to the unanticipated observations that arise in research. On the other hand, they should be in a position to identify talent and excellence when they encounter it and nurture it in the right way.

The ERC plays a very important role in this context. It has just completed the selection of the Starting Grant awardees, whose average age is 36 years. This scheme has made the younger generation of researchers more visible in Europe. It has also succeeded in balancing the recurring theme of young European scientists choosing to work in the United States.

On a broader level, the ERC has fostered competition among European universities, which are now recruiting grantees and at the same time announcing incentives to encourage their staff to apply. Apart from providing considerable research funding, the ERC Grants have established themselves as a ‘seal of excellence’ for the awardees but also for the host institutions. In the discussion that followed, all panellists recognised the ERC’s role as *the* authority in identifying excellent frontier research and agreed that its peer review methods could be exemplary for the European scientific community.

Indeed, after some initial difficulties, the ERC has taken its rightful place in the European research system. It is now an important pillar of EU research funding, one that guarantees investment in frontier research. Yet justification of the research funding the ERC provides, and the evidence for the best use of taxpayer’s money as often called for by policy makers, is, however, not easy to provide in the short-term. Frontier research needs a long-term perspective.. Policy officials should therefore avoid this logic and rather focus on strengthening this institution and increasing its means. The pending reform of the EU Framework Programme could open a window of opportunity to “get the structure right”. We are seeing a very strong emphasis on innovation and a corresponding adaptation of EU science funding instruments. Frontier research has therefore to assert its central place in the EU 2010 Innovation Union.

With regard to the drive for innovation, Professor Nowotny detects a rather problematic approach by science policy makers, who expect to implement innovation with policy rules. Economists have in fact tried for years to find a more robust link between basic research and innovation. The scientific process however, leads from frontier research to applied research, and from applied research to innovation (e.g. as is the case with biomedical research). This is why investment in frontier research must not fall victim to the drive for innovation. At the same time, new schemes such as the Proof of Concept line recently introduced by the ERC can make this process smoother or even ac-

celerate it. Either way, the ERC will not abandon its philosophy of investing in curiosity driven science. Industry is of course welcome to apply.

Session 1: Are our selection instruments fit to identify highly promising, novel, yet risky projects?

The first session looked at the instruments, with which excellent science can be identified and highly promising, yet risky projects can be selected. The discussion focused mainly on peer review. Marja Makarow, Chief Executive of the European Science Foundation (ESF) and Member of the European Research Area Board (ERAB) and Philip Campbell, Editor in Chief of Nature and Nature Publishing Group, set the scene with short statements:

Marja Makarow pointed out that the quality of research depends entirely on the quality of the procedure of selection of the awardees. It is essential for peer review panels to strike the right balance between risk and the anticipated success when selecting research projects for funding. To support this process, the ESF Member Organisation Forum on Peer Review, including 30 research funding and performing organisations, is developing a Peer Review Guide. This document will identify good practices and set a minimum core of basic principles for peer review. Its goal is to define common pan-European quality criteria for peer review and thus minimise the burden on the peers themselves and maximise the assessment of scientific excellence.

Professor Makarow discussed the challenges of peer review with the example of risk assessment. When evaluating project proposals by young investigators, the risk may be high because researchers are at an early stage of their careers. In this case, the referees concentrate on aspects such as the novelty and originality of the ideas and the potential of the applying candidate, in addition to his or her peer reviewed publications. Interviews of the young Principle Investigators by the evaluation panel are also strongly recommended as they can significantly influence the final decision. In an interview, the applicant has to prove that he or she can set short and long term goals and is fully aware of the potential of his or her project. Personality, persistence and self-confidence play an important role in this constellation.

In his statement, Dr. Campbell sketched his journal's selection process for research papers. There are 25 scientific editors at Nature, who are supported by referees across the disciplines. They enjoy a sense of empowerment, due to their independence in making decisions on research papers without an editorial board. To ensure that they are up-to-date in their respective fields, they spend six weeks per year at laboratories and research facilities. Thus, they develop the 'preparedness' to identify excellence when they see it, sometimes independent of 'standardised' criteria such as citations, which do not always tell the truth about the quality of the actual work. One does not deny that there is subjectivity in the decisions the editors make. In fact some important papers have been rejected in the past. Their goal however, has always been to find papers that are scientifically important. With respect to risk assessment and

the selection of risky research projects, journals are confronted with the same challenge as funding agencies: human – and therefore by nature fallible – judgement. One interesting question in this respect would be whether funding agencies could or even should use a quota for risky research.

The discussion that followed revolved around the practice of peer review, its challenges and restrictions, as well as the selection criteria for (risky) research projects. There was broad agreement that peer review panels must be diverse in their views and backgrounds, but also with respect to gender, career stage and age. Referees with industry experience could also be of great value as they could in some cases better assess risky projects and their potential. The importance of interviews of the finalists was also emphasised many times. This process however, is not always feasible. In the case of the ERC Advanced Grants for instance, panellists may often be colleagues of the applicants and therefore may wish to refrain from interviewing their peers.

The differences between natural sciences and humanities with respect to peer review were also an issue. In fact, geographical, gender, cultural and career-age diversity in the composition of panels in the humanities can be a problem rather than guarantee an optimal selection process. On the other hand, risk is not perceived in the same way, for research in this field mainly contributes to cultural heritage. Moreover, a sharp separation of basic from applied research in the humanities is in most cases not possible.

Following this comment, all discussants concurred in that there can be no one rule for peer review, no “one size fits all”, as each discipline has its own structure and necessities. It is furthermore an undeniable fact that funding organisations have an administrative burden through peer review. The capacity and availability of referees is troubling and there is certainly room for improvement in the peer review system. The question is how to best deal with this issue. Should referees be specially trained to review grant applications? Should there be a monetary reward for their work? Can publicly funded research learn something from the industry in this respect? Would it make sense to use alternative peer review mechanisms, for example by considering patents as is done in the United States?

One idea to increase the pool of available peer reviewers is to keep track of successful young Principal Investigators and ask them to volunteer as referees. On the other hand, it was pointed out that especially the young Principal Investigators should focus on their research..

The selection panels however, are not the only ones deserving attention. Researchers themselves often require guidance in applying for grants or using the funds once they have them. Moreover, auditing and complex administrative regulations are also a problem and can in many cases impede rather than support research. Following cases of scientific misconduct in Germany, the Deutsche Forschungsgemeinschaft recently changed its application policy by significantly reducing the number of peer-reviewed publications required for grant application. As of July 2010, researchers may refer to no more than five scientific publications in their applications. This measure intended to emphasise the DFG’s commitment to scientific excellence, while at the same time

improving the selection procedure and discouraging misconduct. In fact, since its introduction, it has – to a certain extent – changed the behaviour of peer review panels by shifting the focus from quantity to quality. What else could be done to contribute to such a shift?

Panels should perhaps look at how honest, instead of risky, a research proposal is. Fundamental discoveries do not happen very often and research is not a straight line but rather a gradual and non-linear process. However, not only gradual development but also paradigm shifts are needed. Assuming that each applicant could or even should make a fundamental breakthrough is the wrong approach to selecting projects for funding. Review panels should therefore be honest about what they expect from candidates. They on the other hand, should never promise too much when proposing a project. Exceptions to this rule are schemes established specifically to fund high-risk high-reward research. The DFG's Reinhart Koselleck Projects for instance, enable outstanding researchers with a proven scientific track record to pursue exceptionally innovative, higher-risk projects.

With regard to the selection criteria applied by the ERC, the question was raised whether an absolute focus on basic research in grant proposals is advisable. In fact, potential application is an intrinsic element of fields such as medical research, which aim at creating a better life. It therefore should not be overlooked but rather become a prerequisite for proposals in specific epistemic fields. Indeed, when the ERC was set up, there was a certain reluctance to continue with the distinction between “applied” and “basic” research, as the boundaries are often becoming blurred. Therefore, the term “frontier research” was chosen instead. Today, this category has been fully embraced and “frontier” technologies are equally welcome.

Beyond public funding organisations, there are also positive examples from privately funded institutions, which have simplified their selection procedures. They however are not confronted with the question of accountability for spending tax payers' money.

Finally, Philip Campbell posed a different, more radical question that paved the way for the remaining discussion: Do we only need more money or also more time for good research? Should we be shifting a substantial portion of our funding to support people – rather than programmes – for a longer, more dependable period of time (e.g. 7 years) and in a more flexible and less bureaucratic way? Considering the competition European research is facing today and will face in the future, we will have to accept the risk we take when giving away money for research. Though the issue of accountability for the use of tax payers' money should be considered, Europe needs to focus on *people* and support them in making the best out of their talents and their research.

Session 2: Are excellence and cohesion potentially opposing goals? Are we making best use of the pool of talents in Europe?

The second session focused on ways to support and promote the talent pool available in Europe and at the same time become more attractive for researchers coming from other continents. Participants also addressed the in their view critical situation in European universities and discussed the ability of these institutions to compete internationally.

John Wood, Chair of the European Research Area Board (ERAB) and Secretary General of The Association of Commonwealth Universities set the scene with a short statement:

Professor Wood posed two, in his opinion fundamental questions: How should we identify priorities in research and are we recruiting the right people in Europe?

When Margaret Thatcher's government abolished tenure and reduced research funding in the early 1980s, a big shock went through British universities. Such reforms, repeated many times in the past in different European countries, have significantly affected universities, often in a negative way. At the same time, they have shown how 'fossilised' the university system is. This diagnosis indeed applies to numerous European universities, where young investigators are often confronted with inflexible, hierarchical structures offering no dependable career options. It therefore comes as no surprise that the modernisation of European universities was one of the first issues former Commissioner for Research, Janez Potočnik, addressed, when he took office.

The university system is in fact unable to accommodate the talent available in Europe. Without a flow of ideas and a constant movement of researchers, stagnation begins. ERAB has produced a Recommendation of how to actively address this situation. Suggestions include implementing the concept of a European Research Passport, establishing summer schools for young investigators and securing pension and social security rights within the European Union. These measures however, are not enough. Many university systems in Europe lack the necessary infrastructure and the financial means to compete internationally. Further allocations of EU Structural Funds for research could contribute to a solution of this problem, as long as they are put to good use and not mismanaged. It is noted that there is a considerable lack of large research management experience both of individual researchers and institutions. This is a major problem especially for newer member states. ERC funds should only support excellence and not be used for capacity building. However, other instruments such as twinning young researchers of institutions could be a way of supporting weaker research and education systems. Other organizations, such as EUROHORCS, could also contribute to this.

Finally, return on investment schemes and cost-benefit analyses are not adequate ways to assess the impact of research. The administrative burden created through such regulations impedes science rather than supporting it. Attention should be paid more to the wider aspects of training and project management which come from participating in large international research projects. As an example, many researchers who have spent time at CERN go on

to jobs in industry and finance where their ability to organise teams around complex objectives is widely recognised.

During the discussion, it was pointed out that the scientific community especially needs to consider the PhDs when referring to the talent pool, since they are the future of research. International graduate and research schools are a very good platform to educate and support doctoral students. In this context, cultural diversity should certainly be fostered, but must not be an end in itself. Gender balance and the use of women's potential on the other hand, is a goal that should be pursued throughout all stages of science careers. Europe also needs the best innovators and entrepreneurs to contribute to economic progress and social stability.

Unfortunately, Europe is still wasting human capital despite significant investment in research and education as well as scores of special programmes on a national and European level. The reasons for this situation are manifold. Some of the most pressing are the lack of dependable social infrastructure for researchers as well as the lack of career perspectives within an inflexible and sometimes even impenetrable academic system, which not only constrains European researchers but also discourages people from other countries from coming to the EU. Furthermore, the potential of women – after all around half of Europe's population and its university graduates – is still not being fully exploited, as the comparably low proportion of female researchers proves. What can be done to improve this situation?

One way would be to actively seek and nurture talent, male and female, in Europe but also outside the Continent. Not all excellent people know they are excellent and are often based in places, where they will never find out. Summer schools, where talented young people are motivated and supported in pursuing a career in research and applying for grants, have proved to be a very effective instrument. Such schemes also foster social and epistemic interaction between participants and in many cases pave the way for future scientific collaboration.

Another possibility would be to create adequate positions for scientists, who wish to focus on research and establish themselves within the scientific community. They would require a considerable amount of independence, though practices in this respect vary from one country to the other. The question of tenure was also addressed by the panel in this context. Some members consider it indispensable, as it would allow researchers to focus on their work rather than on securing their own and in many cases their family's existence beyond the current position. Others believe that tenure can lead to a deterioration of performance and should therefore be awarded only in very special cases. They further argued that competition is the basis of research and where there is competition there is or should also be pressure. Moreover, in their view, tenure could hinder mobility, which is a prerequisite for a successful career in science and very important for scientific exchange and cross-fertilisation. However, mobility is de facto hindered by existing regulations, which often discourage researchers from moving to another country. Therefore, innovative schemes such as a European Researcher Visa are needed to counter this phenomenon. In order to attract non-European researchers, it

was also argued that the “European Research Visa” idea should be extended to “Scientific Visa” to attract researchers from all over the world.

With regard to the quality and competitiveness of European universities and research infrastructure, discussants agreed that global competition is stronger than ever and that Europe will have to invest heavily in order to keep up with the United States, but also with emerging powers such as China. A Europe-wide approach to R&D investment would certainly be of advantage, though partnerships should be pursued in a bottom-up rather than a top-down process. Nevertheless, bilateral agreements and collaboration between EU members and third countries will not and should not cease to exist. On the contrary: competition between European countries sparks innovative approaches to research programmes and funding. Furthermore, a new instrument focusing on excellence in research for a small amount of partners also outside Europe (the ERC provides funding for individual excellent researchers and their teams) could be a timely and wise alternative to large and complex research networks funded under the European Framework Programme.

Strengthening European science in a global context also involves bolstering its very foundation, the universities. The university system and its anachronistic regulations (e.g. with regard to rector positions) should therefore be reformed in order to reflect the needs of today’s and tomorrow’s world. This will be a very slow process, but it is nonetheless crucial that it takes place.

Referring to the excellence vs. cohesion dilemma, panel members debated on the following questions: Can the very large amount of research institutions in Europe be sustained and even reach a comparable level or should we be concentrating our efforts and means on a selected few? Rather than pushing excellent research and neglecting the cohesion aspect, shouldn’t we support both simultaneously with different instruments? How democratic should research funding be? Would a ‘fairer’ distribution of ERC grants for instance really improve Europe’s competitiveness as a whole? Shouldn’t we rather be focusing on funding excellent people wherever they may be in Europe and giving them the independence they need? In this particular context, discussants referred to successful practices abroad. China for instance, has been encouraging excellent Chinese scientists to return from the United States or elsewhere and continue their research under unique conditions at one of the country’s top institutions. The results of this policy can already be found in numerous high impact journals.

Session 3: Funding strategies: How much European co-ordination do we need in a changing global scientific landscape?

Session 3 focused on the funding strategies for European research as well as on the amount and kind of co-ordination and collaboration needed in a changing global scientific landscape. Short statements were made by Professor Matthias Kleiner, President of the Deutsche Forschungsgemeinschaft (DFG), and Professor Maria Leptin, President of EMBO.

Professor Kleiner pointed out that the European Research Area (ERA) should be the main issue and a top priority for science policy makers and the scientific community. Europe is about to unite in this concept which requires the scientific community, the Commission and science itself (the 'third power') to participate in it and structure it. We need subsidiarity and at the same time complementarity, more collaboration and more competition between European institutions and countries.

What can and should organisations do to design ERA? The DFG supports the founding of a new organisation, which would allow the European research community to speak with one voice. This organisation will emerge out of the fusion of two existing entities, the ESF and EUROHORCS, but should become more than just the sum of their parts. Both entities have served European research for many years and have the support of a large portion of European research funding and research performing organisations. The time is right to make this move and the pending reform of the European Framework Programme makes this fusion all the more pressing.

A so called European Research Grant Union, an idea involving cooperative funding by European funding organisations at a very high level, could be another way of fulfilling the goal of a European Research Area. In this process, an international cooperative project is evaluated by a single funding organisation – the lead agency – in accordance with commonly accepted standards of quality. The partner organisations then recognise the funding decision, which the lead agency has made in consultation with them, and the funding organisations finance the part of the research work that is carried out in their respective country.

Finally, all efforts should be made to secure a key role and appropriate funding for basic research within the currently emerging 8th EU Framework Programme. Excellent research infrastructures should also be maintained and in some cases even expanded, as they provide Europe with a competitive advantage over emerging countries.

Professor Kleiner also referred to the importance of the social infrastructure for mobility. Each country should have an interest in recruiting people, who were trained abroad. Their careers and movement should therefore be facilitated, the regulations adapted to their needs.

Professor Leptin referred to the EMBO's history, its modus operandi as well as its structure as a truly European organisation. She especially drew the panel's attention to the successful programmes for young investigators and

mentioned that EMBO has introduced installation grants, a smart alternative to quotas.

With regard to the question of co-ordination vs. individuality, in her view the hard decision is what one does in which case. Who and on what basis makes the decisions on the way to go in research and the models to use? The decision-making process is in fact multifaceted and complex. It involves, among others, intensive lobbying efforts by different stakeholders. In the case of the European Strategic Roadmap for Research Infrastructures (ESFRI) for instance, an involvement of funders, active researchers and administrators is essential. This 'mixture' is reasonable also due to the fact that scientists are biased towards their own discipline. It would therefore be naïve to assume that decisions made by communities of scientists are correct. A system of 'checks and balances' through mixed committees making general decisions, as it is applied by organisations such as the DFG, has proved to be quite effective.

The panel concurred on the need for a more coherent approach to research collaboration, which should build on the long-standing experience with entities such as CERN and EMBO but also with collaborative networks such as EIROforum and the European Synchrotron Radiation Facilities. An important prerequisite would be however, that such structures could not be interfered with and would not be subject to different political agendas. Furthermore, all partners should be able to benefit equally from this undertaking.

It is, in fact, by no means a coincidence that EMBO and CERN were established long before the European Commission even existed. Such intergovernmental collaborative structures would probably not be possible to establish today, not least because of financial reasons. The many flaws of EU research structures and instruments have been addressed over and over. These structures resemble a big and slow-moving 'tanker' that threatens to become immobile. What can be done to alleviate this situation? Should the 'tanker' become smaller or should it rather be replaced by 'speed-boats' that are easier to manoeuvre? This metaphor would correspond to smaller groups of brilliant scientists focusing on specific problems. Would that then mean that projects such as ITER would become obsolete?

Discussants expressed doubts that 'speed-boats' have the necessary critical mass to address the Grand Challenges. In their view, the European scientific community should pursue a simplification of existing structures, rather than increase or decrease the number of instruments and programmes. Processes must become more transparent and user-friendly and therefore more attractive for excellent scientists in Europe and beyond. Furthermore, the three elements of the EU Framework Programme should contribute in a balanced way to the research effort and so should basic research and applied research. Funding and co-ordination within the EU Framework Programme should focus on three main goals: address the Grand Challenges with programme oriented research funding; support top-level researchers in different stages of their career; promote co-operation of national research funding organisations.

Finally, science's contribution to higher education should receive the attention it deserves. If research is not funded and supported adequately, there will be negative consequences for qualitative higher education and we will be practically sacrificing the future of the next generation of academics and scientists.

General Discussion and Conclusions

Following the exchange of thoughts and opinions during the three thematic sessions, the group of experts concluded their deliberations on the status of the European research system today by giving it marks. They thereby tentatively assessed its quality, efficiency, competitiveness and future prospects from their own individual perspective. The marks given by the discussants varied, depending, among others, on their experience in their own field of work. Some experts were optimistic about the situation today and in the future and therefore gave satisfactory to very good marks. Others expressed a pessimistic view of the European research system and therefore gave poor marks. This exercise resulted in an average mark of 3 according to the German grading system, which ranges from grade 1 (excellent) to grade 6 (fail). The result could be interpreted as a clear indication of existing weaknesses coupled with cautious optimism with regard to future potential.

Concretely, all agreed that the European research system is equipped with significant resources (in the sense of man and woman power as well as infrastructure), which however should be exploited more efficiently for the sake of our Continent's future development. Though there are inherent differences among EU countries, but also among scientific disciplines, the average quality level in Europe is deemed satisfactory. The instruments available to support and promote these resources are in many cases insufficient and not up-to-date with current demands. They should be improved and bureaucratic obstacles removed. It was pointed out that more coordination, synchronization and alignment are needed. Finally, with regard to the quality of frontier research, Europe still is in a good position, among others due to the ERC. Pursuing application and innovation as a potential development of basic research should be supported, though innovation must not become an end in itself.

In order to withstand global competition, Europe will have to move swiftly and effectively towards a European Research Area that brings together the best and the brightest in researcher-friendly and future-oriented institutions. Scientists should always be aware of the significant contribution their work makes to society and the economy. Innovation is therefore not a 'bad word', but rather an exciting product of top-rate research, basic *and* applied. Achieving innovation requires the same state of mind as performing excellent research: the 'preparedness' for serendipitous discoveries and the ability to recognise them, when one encounters them.

Effrosyni Chelioti (draft)

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