WISSENSCHAFTSRAT

Theses for the Future Development of the System of Higher Education and Research in Germany

The *Wissenschaftsrat*

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Preface

The deficits of the German system of higher education and research have been debated since the 1970s. In the mid-1980s that debate reached something of a climax. In the period that followed, the primary task of science policy was to consolidate the institutional structure of higher education and science in the former GDR (hereafter referred to as the new German states). It soon became clear, however, that the significant expansion of the potential of the system of higher education and research, as experienced in the course of reunification, had to be coupled with serious reform efforts. International developments in the field of European integration and globalisation have added to a growing awareness of the urgent need for reform in Germany's system of higher education and research.

In the last ten years, the *Wissenschaftsrat* has given a series of impulses towards initiating a debate on the long-term perspectives of higher education policy. The *Wissenschaftsrat* has emphasised existing deficits and the need for future development, not only in their *Zehn Thesen zur Hochschulpolitik* but also in the *Thesen zur Forschung in den Hochschulen*. The *Wissenschaftsrat* undertook evaluations of individual sections of the German academic system in connection with the restructuring of the academic landscape in the new German states. Over the last ten years, the *Wissenschaftsrat* has defined the strengths and weaknesses of the German academic system more precisely in a series of cross-sectional surveys related to specific research fields.

System assessments of the Blue List Institutes[1)] and the *Hermann-von-Helmholtz-Gemeinschaft Deutscher Forschungszentren* or HGF (Helmholtz Association of German Research Centres) were conducted in 2000.[2)] They supplement the system evaluations carried out in the years 1998-99 for the Fraunhofer Society as well as for the *Deutsche Forschungsgemeinschaft* (German Research Association) and the Max Planck Society.

The necessary reform of the German system of higher education and research will, however, still take some time. It is not only necessary to

1) The Blue List is a term used to denote a network of 79 research institutes and scientific establishments nationwide that provide services for research.

2) *Wissenschaftsrat*: *Systemevaluation der Blauen Liste—Stellungnahme des Wissenschaftsrates zum Abschluß der Bewertungen der Einrichtungen der Blauen Liste*, Vol. 12, Cologne 2001. *Wissenschaftsrat: Systemevaluation der HGF—Stellungnahme des Wissenschaftsrates zur Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren*, Cologne 2001.

act decisively in this regard, but especially to focus the reform debate on certain decisive points. In that respect, the *Wissenschaftsrat* has designated prerequisites for action and goals, in the form of theses, which in their view should provide authoritative definition to the reform debate over the next ten to 15 years. These theses are not designed primarily for short-term political implementation, rather they are intended to represent the beginning of a deepening discussion and reform process in the academic system.

The *Wissenschaftsrat* is obliged in particular to the numerous experts from within and outside Germany who helped with the editing of the theses.

The *Wissenschaftsrat* adopted the *Theses for the Future Development of the System of Higher Education and Research in Germany* on the 7th July 2000.

Overview

The past few decades have seen dynamic development in the German system of higher education and research, and it has attained a leading position in the world. In institutional terms, however, it is too inflexible and its contribution to the solution of problems in industry, society and politics is inadequate. Energetic reforms and financial support of a far higher order than is currently available are necessary in order to exploit the potential of the higher education and research system to the full in the present and at the same time to lay the foundation for further development.

To achieve these goals, the *Wissenschaftsrat* believes that there will be three primary tasks to accomplish in the coming years:

Firstly, the German system of higher education and research must be oriented more towards possible applications for research and teaching, and the latter must be far more connected to actual practice. In the area of research this greater orientation towards ultimate application should not be understood as weakening pure research, it should rather be seen as better utilisation. A sustained expansion of sponsorship from the Federal Government and the states for general cross-institutional application-orientated programmes is required. Care should be exercised when setting up the programmes to ensure that the project award

system is structured to be as flexible and as receptive to innovation as possible. Funding must be awarded by transparent processes, following an invitation for tenders for the projects and in competition—and that should include areas where that is not the case today. Ministerial research must be limited to the area that is absolutely necessary for the fulfilment of jurisdictional and regulatory tasks. The funds thus released should be used to enhance sponsorship being channelled into the programme for application orientation. The anticipated increased demand for personnel with higher educational qualifications will then shift to a demand for with academically sound, practice-oriented training and qualification profiles. Therefore, the limited range of specialisations offered at the *Fachhochschulen* (universities of applied sciences) must be broadened distinctly by means of regulatory intervention on the part of the state. This task of burden shifting must go hand in hand with a corresponding shift of resources in favour of the *Fachhochschulen*.

Secondly, the internationalisation of the German system of higher education and research must move forward. Promotion of co-operation and exchange must be continued and intensified and beyond that, the teaching and research content must be considerably more internationalised than has been the case up to this point. This will be a special task for the humanities and social sciences in future. The foundations for new transnational institutional structures, which already exist at a European level, must be reformed and developed further. The member states of the European Union should withdraw wherever possible from any attempt to control the details of the framework programme. A structure must be created at the European level, independent of the Commission, for the promotion of pure research. Research facilities that have multinational European backing must become a matter of course and should have a thematic focus.

Thirdly, greater use must be made of information and communication technologies than has previously been the case. Higher education facilities, in particular the universities, must be at the forefront of the use of digital media. Greater use should be made of electronic media in teaching. In order to raise their international presence and visibility, institutions of higher education should create 'virtual institutions' coupled with setting up branch institutions abroad.

Successful mastery of these tasks will hinge on the implementation of reforms in the following fields of action:

– The institutions of higher education must raise their profile. Although the subdivision of the German system of higher education and research by mission makes basically sense, it nevertheless tends to promote the mutual separation of these institutions from one another and so is not sufficient in itself. In future, the actual activities and performance of these academic institutions should figure much more prominently as reasons for resource allocation than has been the case up to now. Raising an institution's profile and concentrating on its most efficient areas may mean, in fact will necessarily mean, inefficient institutions or parts of institutions need to be closed. To counteract the manifest tendency towards inertia in the academic system, research facilities should only really now be established with a narrowly delineated mission and, initially, for a limited period.

– The mobility of academics and students must be increased. The *Wissenschaftsrat* considers it necessary to develop study and qualification structures with universally binding certification standards that tie in with the ongoing integration of of the European Union. Any reorganisation of the parameters in the academicising employment market must have as its aim the elimination of the innumerable obstacles to mobility that currently exist. A large degree of personal mobility, wide experience of both domestic and foreign institutions of higher education and excellent performance must be reflected clearly in academic salaries. In future, only those scientists who have had work experience at and with recognised foreign academic institutions should be appointed as professors and to other senior positions in the academic system.

– Greater institutional competition is a crucial instrument for counteracting the previous overemphasis on functional differentiation in the German system of higher education and research. The initial signs of more flexible funding for basic provisioning through the establishment of central funds within the higher education institutions must be built on considerably. In future, the proportion of the overall budget of a facility allocated to that type of funding should be assessed in such a way as to provide a clear incentive for seeking such funding. External institutional competition must be reinforced substantially by stepping up non-institution-specific application-oriented programme funding. The *Deutsche Forschungsgemeinschaft* (German Research Community) - (or DFG) will continue in the future to be the most important instrument for promoting external competition

in the area of independent research, oriented exclusively to the standards of scientific excellence.

– In future, greater use must be made of opportunities for co-operation among different academic institutions, also to bring together publicly and privately financed institutions. The range of forms of co-operation should be developed further and should encompass forms of co-operation that have rarely been tried up to this point, for example, co-operation between *Fachhochschulen* and *Hochschulen* (universities). Concentration of a number of different academic institutions in a single location should be utilised to form complex groupings, which would also include private partners. Significant support should be given to such clusters through awards of additional funds, in particular under the framework of expanding application-oriented programme sponsorship. Formation of virtual clusters should also be promoted.

– The capacity of academic institutions facilities for self-organisation must be increased. The subsidiarity principle should be the foundation. Implicit in this goal is the assumption that institutions of higher education have adequate administrative support. Steps already taken to relocate administrative capacities and resources from the ministries and scientific organisations into the academic institutions themselves must be intensified. The Federal Government and the states should withdraw as much as possible from controlling institutions of higher education at the detail level. This also means that regulations such as the capacity ordinance should only be of a transitional nature. In the long term, this outdated instrument of control must be completely dismantled and replaced with specific regulations in the context of agreements regarding goals, which would enable the state and higher education institutions to come to an understanding about the potential number of students to be enrolled. Instruments of higher education policy, such as evaluation and prospection, which are used in the decision-making process will become increasingly important and thus need to be optimised further. When developing new processes for measuring performance and quality assurance, also in a teaching context, care must be taken to ensure that these are designed to be transparent and appropriate to the situation—consideration should also be given to the limited availability of expert assessment capacity. In addition, the processes for evaluation of research and teaching must be focused on assuring and enhancing quality and promoting innovation.

– The unity of research and teaching must be renewed. At the same time, the increasingly divergent development of research on the one hand and teaching on the other must be considered. The institutional setting within the system of higher education and research that offers the best chances for timely renewal of the unity of research and teaching is to be found at the universities. For this to happen, the universities must not only be outstanding places of research and teaching but also academic organisational centres. This necessitates that the universities realise within their walls at least a part of the institutional differentiation that has occurred outside their walls.

– Access to publicly financed institutions of higher education must continue to be open in academic system of the future and must be based exclusively on aptitude and performance. The significance of privately funded higher education institutions will increase, as will private training opportunities. Correspondingly, the state has the responsibility to ensure that transparent quality standards are developed for this market. Private higher education institutions can supplement and complement what the state has to offer, provide innovative stimulus and have an invigorating effect in terms of competition. In such cases, private higher education institutions can be an interesting contractual partner for the state and a welcome co-operative partner for publicly funded higher education institutions in the context of the public-private partnerships. This does not change the fact that private higher education institutions have to be financed from private sources.

– As these reforms are implemented, the *Wissenschaftsrat* deems it necessary for the Federal Government and the states to make a significantly higher financial contribution to the promotion of higher education and research. If Germany is not to fall behind in comparison to countries of comparable economic power, then it must create the foundations for a future system of higher education and research with that in mind.

Realising the potential

The publicly funded German system of higher education and research[3)] has expanded greatly over the past decades.

In 1960, when the *Wissenschaftsrat* issued the first of its recommendations for the development of academic institutions, there were around 190,000 students at the 38 scientific higher education institutions in what was then West Germany. The number of professors amounted to little more than 3,000. In the former GDR there a total of around 132,000 students were enrolled in the year 1988 at 53 universities and institutions of higher education.[4)] In 1999, nearly 2 million students attended Germany's 313 higher education institutions and the number of professors has grown to nearly 40,000.

The expansion of Germany's higher education institutions suggested by these figures has been accompanied by pronounced institutional differentiation. Since the 1970s, the *Fachhochschulen* have been added to the universities and the technical universities. Today there are some 400,000 students attending 152 *Fachhochschulen*. Of the 230,000 final examinations taken in 1998 at German institutions of higher education, around one third were allotted were taken at *Fachhochschulen*.

As in the universities, non-university-based research has also grown in the last decade and has diversified in institutional terms. The Max Planck Society, established in 1948 as the successor organisation to the Kaiser Wilhelm Society, itself founded in 1911, employed 3,000 in 1960. Today there are nearly 12,000 employees working in the 83 facilities of the Max Planck Society. The Fraunhofer Society, founded in 1949, had fewer than 300 employees spread across 14 facilities in 1960. In the last few decades it has established itself as the largest sponsoring organisation in Germany for industry-oriented contract-based research. In 1999, some 9,000 employees worked in their 47 installations. The large-scale research establishments (*Großforschungseinrichtungen*, abbreviated as GFE),[5)] founded since the mid-1950s, have developed into an important branch of non-university-based research with over 20,000 employees in

3) A current overview is offered by Dagmar Schipanski: *Structures of the German Science System: an Overview*, in: *Wissenschaftsrat: Reden, Vorträge und Statements der Vorsitzenden des Wissenschaftsrates, 1996-1998*, Cologne 1998, p. 57-65.

4) *Statistisches Jahrbuch 1989 der Deutschen Demokratischen Republik*, 34. Jahrgang, Berlin 1989.

5) The GFE merged to form the HGF in 1995.

16 centres at the present time; they pursue long-term research goals on behalf of the government. The number of Blue List[6] institutions, jointly supported by the Federal Government and the states, which pursue a multitude of research and service tasks in the general national interest, has grown greatly, especially as a result of reunification. Today there are over 12,000 employees active in 79 Blue List facilities. Over and above that there are a multitude of other publicly backed research institutions, for instance in the context of departmental research at the level of the Federal Government and the states. More than 20,000 employees work in the departmental research facilities of the Federal Government alone, which currently receive DM 3 billion in annual support.

The combined efforts of the Federal Government and the states and the academic establishment since the 1950s have ensured that the German system of higher education and research was able once again to regain a remarkable level of performance following the Second World War, and also achieve a leading position in the world against the background of the expansion of academic systems worldwide and increasing international competitive pressure. Despite the successes that have been achieved in developing the German system of higher education and research over the last few decades, there are unmistakable signs of weakness. These may be summarised in three main points:

- The academic system is too inflexible from an institutional perspective. Institutional and regulatory barriers stand in the way of dynamic development in research and teaching.

- There is insufficient interaction between higher education and society. The science system does not contribute enough to the solution of economic, social or political problems.

- The budget allocated to the German system of higher education and research must be evaluated against that of its most active competitors if the acknowledged close relationship between academic development and economic prosperity is really to be taken into account. There are clear signs in this regard that the German system of higher education and research is under-funded in comparison to others.

Publications on higher education policy recount variations on this theme. Frequently, the impression is given that a complete reorganisation

6) The Blue List Institutes joint forces to form the *Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz* (WGL) in 1995.

of the system of higher education is in order. That is neither possible nor necessary. In the last 40 years, significant success has been achieved in the development of the academic system, but that potential has in no way been exhausted. Achievable modifications and improvements have too often been hindered by a mentality of vested interests, customary complaining and over-regulation. Given the sheer dimension of the clear future challenges, it is appropriate to put an end to this situation and take action on the basis of the multitude of collated individual analyses of the shortcomings of the German system of higher education and research that have been conducted over recent years. The goal must be to mobilise the potential of the system that has been created in the last 40 years and rapidly to set in motion the requisite institutional changes. The changes can, and indeed must, be introduced through basic regulatory measures. The *Wissenschaftsrat* considers that stimulus and support in the form of self-regulation mechanisms, already in place in the system and in interaction with society, promise to be more successful than an essentially regulatory-oriented strategy. However, such mechanisms are too frequently impeded by a plethora of restrictions and limitations erected by the institutions.

The challenges that Germany's higher education and research system faces today, which can be evoked by the key words 'application orientation', 'internationalisation' and 'information and communication technology', are so complex that they can only be tackled in a step-by-step process that allows for the participation of all relevant players. As at the end of the 1950s, it is again necessary for the Federal Government and the states, the academic community and industry to work together to solve this task. The oft-heard criticism in recent years of the fundamental federal structure of the German system of higher education and research and its efficiency deficits is certainly not unwarranted. However, in the view of the *Wissenschaftsrat*, this sort of criticism has failed to recognise the potential inherent in this structure. Competition between the Federal Government and the states to achieve optimum support for higher education, controlled as it is by co-ordination mechanisms, ensures that a multitude of different stimuli find their way into the process of negotiating and formulating higher education policy. And this process corresponds in great measure to the necessary complexity of current and future policies of higher education. The federal structure underlying the system of higher education and research does lead in part, however, to co-ordination problems and activity blockades. Consensus building processes between the Federal Government and the states on the one

hand, and within the states on the other, often founder by virtue of sheer inertia. These problems must be overcome through a joint and concerted effort by the Federal Government, the states and the higher education community.

Strengthening the application focus and connection to actual practice

The close relationship between higher education and the practical reality of society has been acknowledge from the very beginning of modern science higher education.[7)] However, the degree to which the academic, social and political spheres are reliant upon the utilisation of scientific knowledge and insight, together with the intensity of the ensuing interconnection of science and social practice, has since reached a new level. Utilisation of scientific knowledge is no longer a matter of choice. It has become a necessity. Science's increased influence on the way life in society is shaped means that vast areas of contemporary academic study rely on continual contact with practice as seen in society for their development. This applies not just to areas such as engineering where the link to practice in society is clearly evident. In that regard, the system of higher education and research will have to find solutions to two tasks in future:

- The interaction of the academic sphere and society and the capacity of academic and scientific practice to engage in interdisciplinary research activities directed towards the solution of complex problems must be improved. At the same time, the academic community must not settle for a reactive role. In those industries that are at the cutting edge forefront of economic development, the academic community can, and indeed must, be actively moving the innovative process forward. In the new German states (the former GDR), which still find themselves in a phase of economic structural transformation, the institutions of higher education, in particular the universities, must become the engines of structural change.

- Academic and scientific knowledge must be imparted to a growing number of people. Here too, the task will be to strengthen the practice-oriented interdisciplinary focus.

7) Paolo Rossi: *Die Geburt der modernen Wissenschaft in Europa*, Munich 1997.

These requirements have essentially been acknowledged for a long time. However, in spite of many initiatives attempted in that regard in past decades, there has so far been no success in structuring the German system of higher education and research in such a way that it can fulfil its mission through a meaningful combination of its various elements in a flexible and optimum fashion. One important reason for this is that in terms of administration and policy of higher education, many are still holding on tight to traditional stereotypes of reasoning and practice. The two main stereotypes are the supposed opposites of pure research and application-based research,[8] and academic education and vocational education.[9]

Distinctions of this type have in the past engendered the high degree of mission-related differentiation that is characteristic of the German system of higher education and research. Still today, this differentiation in the German system of higher education constitutes one of its fundamental strengths. It is, however, only sensible in future if accompanied by a high measure of flexibility with regard to practical co-operation between the various elements of the system. Academic practice increasingly eschews classification in conceptual and administrative diagrams, and tackling complex problems from societal practice normally only succeeds when various established authorities from different functional areas of the system are brought together.

Task-related delimitations between institutions of higher education without adequate flexibility and networking in the course of research leads ultimately to paralysis. Herein essentially lies the reason why the potential of the German system of higher education and research has yet to be exploited fully. The *Wissenschaftsrat* is of the opinion that, in view of the future tasks the system faces, this problem must be addressed again, and this time more energetically than ever before.

8) To determine the relationship between pure research and application-related research, cf. Winfried Schulze: *Grundlagenforschung in den Geisteswissenschaften*, in: *Akademie-journal* 2/98, p. 1-6, as well as Jürgen Mittelstraß: *Leonardo-Welt: Über Wissenschaft, Forschung und Verantwortung*, Frankfurt am Main 1992.

9) F.K. Ringer: *The Decline of the German Mandarins*, Cambridge, Mass. 1969.

Research

In the schematic diagrams of the publicly financed system of higher education and research in Germany, the area of knowledge and application-oriented pure research is generally assigned to the universities and the Max Planck Society. Varied forms of application-related research are depicted as the tasks of the GFEs, Fraunhofer Society, the Blue List Institutes, research institutes within the sphere of government ministries and the *Fachhochschulen*. Assigning different research types to individual institutional sectors of the academic system is only partially correct, and even less so today than in the past. The universities and the Max Planck Society make significant contributions to application-oriented research, and other institutions working primarily in application-related areas are also in many cases highly involved in pure research. Interconnection of this sort should be strengthened, not separated administratively. Co-operation with industrial firms engaged in research who make contributions in the area of pure research must also be strengthened. Reinforcing the application orientation of research does not mean reducing pure research; rather it is better utilisation of its potential for solving industrial and societal problems. Pure research that has vitality and is well funded is the means by which science increases knowledge and discovery undertaken in an atmosphere of free self-determination and responsibility and is the clear prerequisite for strengthening the contribution science can make to solving problems in industry and society.[10)] Germany has always had great strengths in precisely this area, which is why they must be secured and enhanced, not least in view of the efforts of some competing nations to improve the position of pure research. However, the need to maintain and further expand these existing strengths must not distract us from the significant shortcomings that exist in terms of the application focus of research.

The obvious way to strengthen the orientation of research towards actual applications is to increase support for application-related programmes in combination with structural reforms and a sustained increase in funding. One of the options that has been considered on occasion is to expand and redesign the mission of the DFG. This is not an option in the view of the *Wissenschaftsrat*. The DFG already promotes application-related research to a great extent. However, irrespective of whether it is a matter of pure or application-related research, the focus of the DFG's

10) Wolfgang Frühwald: *Die Goldmacher in Darmstadt. Über das Verhältnis von Neugier und Profit in der Forschung*, in the same: *Zeit der Wissenschaft. Forschungskultur an der Schwelle zum 21. Jahrhundert*, Köln 1997, p. 70-79.

activities has always been to promote self-determined research aiming to achieve knowledge innovations according to principles of academic quality.

Given the significant amount of funding being awarded, this task will increasingly require overarching prioritisation from the DFG itself. Even the opportunities in that regard are available today go largely unused.[11] Yet strengthening of strategic elements in its promotional activities does not change the basic character of the DFG as an institution of academic self-management. Transferring tasks related to the promotion of purpose-directed research, aimed directly towards economic innovation, would overtax the DFG and would mean in the long term detract from their core activities for the promotion of pure research.

Promotion of application-related programmes is primarily a task of the state. Governments and parliaments assume an important structuring function in this area, that will only become more significant in the future. This is especially true of the Federal Government, which is already the single most important player in programme support today and is therefore in a position to stimulate synergetic effects in research promotion to a special degree. However, reform and expansion of application-related programme support at the level of the states is also necessary, with special emphasis being given to flexibility and openness to innovation when projects are awarded. Any efforts the Federal Government and the states make towards expanding application-related programme support should be based on the following parameters:

– Promoting co-operation among the state, industry and the academic community

  The goal of expanding application-related programme support must be to achieve improved dovetailing of research and social practice. The state plays the role of initiator and moderator of the programme identification as well as that of financial backer. The state should ensure a balanced relationship between short, medium and long-term programme goals. The programme identification process should be structured to be as transparent as possible incorporating all relevant participants. Modern diagnostic instruments, such as prospection

11) Wissenschaftsrat: *Stellungnahme zur Denkschrift der Deutschen Forschungsgemeinschaft: Perspektiven der Forschung und ihrer Förderung, 1997-2001*, in: *Empfehlungen und Stellungnahmen 1997*, Vol. 1, p. 7-42. See also: *Forschungsförderung in Deutschland. Bericht der internationalen Kommission zur Systemevaluation der Deutschen Forschungsgemeinschaft und der Max-Planck-Gesellschaft*, Hannover 1999.

or Delphi processes, for example, should be incorporated wherever possible and useful. One-sided emphasis on long-term programme goals, as frequently occurred in the past, should be avoided. Programmes that are oriented towards the problems that are important to society and less towards individual processes and instruments should set the direction for this kind of support. Collaboration between the academic community and industry in the execution of joint projects should be promoted. The possibility of significant, temporary tax relief for businesses that take an active part in the programme identification process as well as programme implementation is an option that should be explored.

– Activating synergistic potential in the higher education and research system

  Application-related programme support must aim to bring together for fixed-term projects those players that are relevant to a specific task, independent of their institutional affiliation. Integrated research of this type is an important instrument when it comes to activating as yet untapped synergistic potential. This potential best can be utilised if projects receive support exclusively on the basis of open programme tenders and clearly defined performance standards. Funding must be awarded exclusively according to criteria relating to programme-related academic quality. Simple application procedures and rapid decisions on applications are crucial, precisely with regard to this type of support.

  Marked differences in levels of basic institutional funding and in the organisational forms of different institutions contribute to a situation where opportunities for universities and research facilities to participate in programmes, regardless of their scientific performance, are far from equal. Many non-university research facilities are in a better initial position to apply successfully to invitations to tender for application-related programme support since they generally have better base funding and are organised much more like a business, both factors allowing them to translate their academic potential quickly into funding applications. Such problems are also evident in the relationship of certain institutional sectors of non-university research. For example, Fraunhofer Society, Blue List and Helmholtz Association institutes operate in many instances in similar or overlapping areas of application-related research, without having resolved

the problem of distorted academic competition that results from different levels of base funding.

Efficiency is an important aspect of support-related decisions. In the view of the *Wissenschaftsrat*, cost/performance calculations need to be developed for each of the institutions in the various parts of the higher education and research system. Subject relevance and programme-related quality should be decisive factors in decisions regarding application-related programme support. The consequences of the different systems of base funding must be taken into consideration wherever possible. In those areas where long, fixed-term programmes are being implemented, there should also be the possibility of coupling project sponsorship with infrastructure measures. Application-related institutional configurations established at universities and funded on a fixed-term bases, in which different facilities resolve programme research tasks together, represent a possible way of improving co-operation between university-based and non-university-based research.

In the course of the re-organisation and expansion of application-related programme support, the project sponsors and comparable publicly financed government and state institutions should be developed further to form a network of agencies sponsoring application-related research. Funding must be awarded by means of competitive project tenders, in a transparent process, including in those areas where it is not generally the case today. The *Arbeitsgemeinschaft industrieller Forschungsvereinigungen* (Association of Industrial Research Organisations), which makes considerable contributions towards promoting research relevant to small and medium-sized businesses and which, among other things, has a pool of experts for research at *Fachhochschulen* at its disposal, should therefore be given special consideration on the basis of their specific organisational experience.

Given the generally interdisciplinary character of research backed by this instrument, and the very close link between this sort of research and applications in practice„ it is important to give strong support to substantive and administrative co-operation among the agencies. In order to prevent conflicts of interest, the agencies should be accorded a high degree of operational independence. In particular, close organisational interlinkage with institutions that themselves carry out research, must be reconsidered.

The agencies will need a great deal of flexibility in institutional and personnel terms. This flexibility will be best assured by their competing to achieve optimum efficiency and low costs in programme administration. Regular evaluations should ensure that this type of competition is producing results. The *Wissenschaftsrat* considers it necessary to move quickly to examine existing institutional structures of public programme sponsorship—which have long been the object of critical discussion—in the context of a system evaluation.

– Mobilisation of flexible reserves at large-scale research institutions (GFEs) and departmental research institutions.

  Both GFEs and departmental research facilities serve different governmental research goals and constitute an important potential above all for problem-oriented research. And facilities of this kind will continue to be necessary in the future at a certain level. The institutional resources channelled to departmental research facilities should, however, be limited to that which is absolutely necessary for the discharge of jurisdictional and regulatory tasks. In addition, serious attention should be paid to the question of whether such tasks might not be transferred to existing, institutions of proven academic worth, in order to release in some cases significant resources that are currently tied up in departmental research facilities. The resources thus made available in should be used to enhance application-related programme support. Furthermore, it must also be explored whether jurisdictional and regulatory tasks might not in certain appropriate cases be assumed by independent private entrepreneurs charged with regulatory duties. This type of transfer would release significant funds. These should be deployed in expanding the level of application-related programme support.

  The large-scale research facilities (GFEs) can contribute to the solution of especially complex problems thanks to their concentration of staff and infrastructure as well as the crossover they achieve between pure and application-related research. Greater flexibility for these facilities must, however, be moved forward by measures such as subject-based programme management that is already planned. This will affect the flexibility of content, processes and structures. This thematic openness must be promoted with separate funding, in addition to the programme-based management; funding, though, that is available for new subjects of research without undue passage of time in the decision-making process. Flexible processes are essen-

tial, above all if the potential synergies inherent in collaborative research and networking with partners from other parts of the higher education and research system are to be realised. This sort of networking must be achieved not just in the research itself, but also in the support given to that research. To achieve that goal, consistent coordination and a synergetic use of institutional and project sponsorship is required, with base funding resources, not just at large-scale research institutions, being managed via the allocation procedures under programme sponsorship.

Teaching

The demand for graduates in the job market is set to continue to increase. Correspondingly, the enrolment of students in higher education institutions will grow, indeed it must grow.[12)] According to current estimates,[13)] it can be assumed that 30 % of jobs created by the year 2015 will require graduates from higher education. This will demand special efforts on the part of the institutions of higher education: in 1998 the proportion of graduates to the total working population was not more than 16 %, lagging behind the USA (29 %), the Netherlands (28 %), Norway (26 %) and Canada (21 %).[14)] The quantitative focus of that demand for graduates will shift further in the direction of academically sound, practice-oriented training and qualification profiles. At the same time, however, the quantitative demand for graduates with research-based training for employment outside the areas of academic teaching and research, and for academics in general, will also grow. The qualitative demands made on the next generation of scientists and academics will also increase further. In short, both the proportion of graduates in the working population and the level of training must be raised.

The marked expansion of training activities at universities since the 1960s has led to a broadening of the range of practical, job-oriented courses of studies being offered.

The *Fachhochschulen*, which concentrate their training efforts above all on practice-oriented higher education, the brand of qualification most

12) *Wissenschaftsrat*: *Stellungnahme zum Verhältnis von Hochschulausbildung und Beschäftigungssystem*, Cologne 1999.
13) Working group *Fortschreibung Beschäftigungsperspektiven* of the BLK: *Perspektiven von Arbeitskräftebedarf und -angebot bis 2015*, Bonn, May 2000.
14) OECD, *Bildung auf einen Blick*. OECD-Indikatoren. Paris 2000, p. 37.

sought after by the job market, represent an important share of that range. 16 % of the workforce had graduated from an institution of higher education 1998; of those 6 % had qualified at a *Fachhochschule* and 9 % at a university. Although that figure means that the number of *Fachhochschule* graduates in the workforce had more than doubled in comparison with 1978, it still does not translate into anything approaching a correct distribution in the employment system.

The fact that the overwhelming majority of students opt to study at universities has long hindered these institutions in fulfilling their duties in both teaching and research. The *Fachhochschule* cannot play their role in the area of academic-based practice-oriented training as fully as is required because their academic spectrum has not been broadened to the extent that would have been objectively possible or useful, and because the specific brand of access they require to research and development is still too rare. Added to that is the persistent status problem of the *Fachhochschulen*, in particular in the public sector of the job market.

Since the beginning of the 1990s, the *Wissenschaftsrat* has recommended time and again a large-scale expansion of the segment of the *Fachhochschulen*. It suggested just recently suggested—with regard to the situation in Berlin—that the training capacities of the universities be transferred to the Fachhochschulen.[15)] The hindrance in the long-term process of differentiation of higher education institution training can obviously only be removed by a real broadening of the limited academic spectrum of the *Fachhochschulen* by regulatory intervention from the government and a corresponding transfer of resources. Admittedly, such a transfer cannot be effected overnight by a single political directive without doing great harm to the entire higher education system as well as to the current and future generations of students. It must be a gradual process of development over the course of which the *Fachhochschulen* can set up new subject areas or strengthen existing ones and the universities can concentrate correspondingly more and more on research throughout their entire subject canon, on the education of the new generation of academics and on research-oriented training for vocational employment outside the fields of research and teaching. The future system of higher education should no longer force new students who wish to study at a *Fachhochschule* to switch to a university on the basis of the admission requirements, which is the case today. By the same token, the

15) *Wissenschaftsrat*: *Stellungnahme zur Strukturplanung der Hochschulen in Berlin*, Mainz 2000.

Fachhochschulen must also be in a position in the future to actually accept students who are interested in a practice-oriented education and qualify for entrance to a higher education institution. The advantage of such an intervention would be that state investments could be deliberately directed at the particular area of higher education that can respond rapidly to the job market. In addition, one can expect cost optimisation effects to result from such a measure. This kind of measure will also permit both the *Fachhochschulen* and the universities to concentrate on the areas of their teaching which represent the core of their respective specific training responsibilities. Relieving the universities of teaching tasks that are not closely connected with pure research or application-oriented pure research could then be linked to the elimination of the shortcomings in the practice-orientation of German higher education studies—shortcomings which have been repeatedly and justifiably criticised.

The *Wissenschaftsrat* feels that the next 10 to 15 years will be all about effecting such a change and thus about achieving a new distribution of students and graduates between the universities and the *Fachhochschulen*. The quantitative focus must clearly lie in the area of the practice-oriented, academically sound vocational education. A shift in the workload must however also be linked to a shift in resources.

Practice-oriented study opportunities aimed at providing an academically sound qualification for professional employment form the core of the autonomous educational mission of the *Fachhochschulen*. They are not educating future academics. To be able to fulfil their educational mission properly, the *Fachhochschulen* require access to research, access which is autonomous, institutionally guaranteed and adequately funded. One of the roles of research and development at the *Fachhochschulen* is to ensure that teaching develops constantly and remains up to date through participation in research. Secondly, application-related research and development at the *Fachhochschulen* have established itself in the form of industry-responsive project-related research on which small to medium-sized businesses have come to depend. These aspects are acknowledged to play a particularly significant role in the direct regional setting of the respective institution of higher education. More important than the cost-intensive expansion of their own major research capacities. However, should be the research that *Fachhochschulen* conducted in collaboration with industry, the universities and non-university academic institutions. The more application-oriented the research is, the more it can be expected that third party, i.e. non-governmental funds, will be

forthcoming from those who are implementing and using the research results.

In the light of their special institutional mission, the training capacity of the *Fachhochschulen* must be expanded. In future, their educational mission should no longer be artificially limited to a restricted range of subjects. Where the curricula of a subject at a university and a *Fachhochschule* are largely identical, as is the case in particular with architecture, business management, the *Fachhochschulen*, following the example of the engineering sciences, should take responsibility for educating the large majority of students. Broadening the subject spectrum will include aspects of subjects which, though traditionally located in the universities, are neither oriented towards the current job market nor do they have an ongoing connection to research—these include for instance the legal sciences, teaching or the applied natural sciences, for example, pharmaceutical science. On the other hand, the *Fachhochschulen* are not suited to all of the disciplines represented at the universities. In subjects such as the humanities where the research focus is so defining and crucial, the university must be the location. The universities therefore have an even greater responsibility to ensure that graduates of these subjects do not leave without being given timely vocational or professional orientation.

Despite of its structural and substantive deficiencies with regard to research and research-oriented teaching, given the essential coupling of research and teaching to health care, which will remain true in the future, medicine is a subject that cannot be categorised schematically. Its place in the future higher education system requires careful examination, particularly with regard to the question of strengthening performance in the area of clinical research,[16)] and of providing more stringent support for the new generation of academics on the basis of research-oriented teaching whilst at the same time increasing the intensity of the practical aspects of a medical education.

The core of the definitive training mission of the universities, which will remain true in the future, is first of all the cultivation of the new generation of academics by encouraging them to conduct independent research as early as possible and, secondly, research-oriented education for professional employment outside academic research and teaching. The institutional expression of this specific educational mission at the

16) Deutsche Forschungsgemeinschaft: *Klinische Forschung—Denkschrift*, Bonn 1999.

universities—namely their exclusive right to confer doctorates—must remain intact. The education of an excellent and internationally competitive new generation of academics is crucial to the innovative strength of the entire system of higher education and research and therefore indirectly crucial for both industry and society, also. And the application-orientation and relationship to practice in Germany's system of higher education in both research and teaching will only be achieved by means of young scientists who, during their phase of intellectual maturation, encounter conditions at the universities—conditions both of a material and non-material nature—that are conducive to creativity. This is not the case at many universities today and that must be changed. Educating the new generation of scientists must be developed into a separate sector of the universities' educational courses with specific performance standards, for which a disproportionately high level resources must be made available. Special emphasis must be placed on the establishment of post-graduate, especially doctoral, courses of study. All of these measures should support the university's move back into the very heart of the system of higher education and research.

Just as it would be irrational to deny the *Fachhochschulen* autonomous and institutionally assured access to research, so would it also be improper to restrict the educational responsibility of the universities exclusively to the education of the new generation of scientists. As was demonstrated for instance by the engineering sciences, the job market has a specific demand for the graduates of research-oriented courses of study for use in vocational fields outside of research and teaching. This will continue to be an important task for the universities in a future system of higher education. In addition, it should not be forgotten that the decision regarding a student's aptitude for a more practice-oriented or a more academic-oriented form of higher education can frequently not be made at the beginning of a course of study. This decision is normally the result of personality development and/or a performance-oriented selection process. Even university students who change direction in their studies mid-course are entitled to a qualified and qualifying diploma that can compete on the job market with the qualifications of the graduates of other educational curricula of tertiary education. Universities cannot therefore neglect contact with vocational practice despite their alignment with research, particularly not in the courses of study they offer that lead to a (first) vocational diploma. Precisely in this area of their study programs, it is perhaps worth considering the establishment

of joint courses of study that enjoy the backing of both universities and *Fachhochschulen*.

As well as profiting from the new generation of researchers among the graduates from their own courses of study, the universities should also increasingly draw on graduates of other types of institutes of higher learning. If acceptance in a graduate course of study at a university were made dependent upon defined subject prerequisites and not upon the institutional status of the higher education institution previously attended, many of the host of problems that persist today regarding the free interchange between various types of institutes of higher learning would be eliminated—specifically there would no longer be a problem conferring a doctorate on graduates of *Fachhochschulen*. The new study structure with Bachelor/*Baccalaureate* and Master/*Magister* degree courses at universities and *Fachhochschulen* will do a great deal to accelerate and ease this process.[17)]

In addition to a sharper delineation of the specific educational mission of universities and *Fachhochschulen*, the *Wissenschaftsrat* considers certain supporting measures to be necessary or useful:

The acceptance of *Fachhochschulen* can be further improved by the designation *Fachhochschule*—which is incidentally inaccurate—becoming just one of several possible names from which the *Fachhochschulen* could choose in a future system of higher education and as an alternative or in combination the term *Hochschule* could be selected and coupled with a supplementary term outlining the institution's field of activity. In this respect it should be noted that when presenting the German system of higher education abroad today there is already a development under way—with clearly unstoppable momentum—to use the generic term 'university', and then for a *Fachhochschule* to add the supplement 'of applied sciences'. Above all, the career regulations of the public service must finally be reworked so that the salaries/remuneration in public service are no longer based on the formal status of the higher education institution the employee attended, and instead based exclusively on the specific job and one's performance in that job. The mechanisms for the allocation of public resources to the various types of institutions of higher education should be fashioned in such a way that the appropriate expression is given to their respective institutional missions. The

17) Compare with *Wissenschaftsrat*: *Empfehlungen zur Einführung neuer Studienstrukturen und -abschlüsse (Bakkalaureus/Bachelor—Magister/Master) in Deutschland*, Berlin 2000.

current procedures for assessing research performance at institutions of higher education must be improved and the procedure for allocation of resources on the basis of teaching performance given a more differentiated structure than today. This will almost certainly mean for the entire higher education system that resources will be withdrawn where the appropriate levels of performance are found to be lacking.

The future salary/remuneration of professors must reflect the demands of the recommended future system of higher education. At the same time, consideration should be given to the fact that the *Fachhochschulen* will have a significantly higher requirement for higher education teachers than in the past and must be able to arrange attractive salary/remuneration packages to make a successful case on the job market. The *Wissenschaftsrat* emphatically supports the current endeavours to make the requirement for qualitative performance evaluations based on precise job descriptions an important component of salary/remuneration for all higher education institutions.

The challenge thrown down by the term 'lifetime learning' affects both *Fachhochschulen* and universities. The almost exclusive orientation of higher education studies up to this point oncourses of study that are geared to the lifelong pursuit of a single profession is out of step with the times. In the course of the accelerating dynamic of economic development and individualisation in life concepts and lifestyles, the inherited notion of lifelong employment in only one profession appears increasingly unrealistic. The higher education institutions must respond to this development by preparing a broad spectrum of part-time and further educational opportunities alongside an academically sound vocational and application-oriented initial education and at the same time use to the full the new possibilities being opened up by modern information and communications technology. The goal is to dovetail educational and vocational phases so that the individual desires of the students, as well as the requirements of the job market are brought into harmony. In particular, continuing education must become a constitutive task of both the universities and the *Fachhochschulen*. At the present time, many higher education institutions are hardly in a position to take on this new role due to the lack of corresponding management capacity. The state must create the conditions for their assuming such a role. At the same time, the state must produce the suitable underlying labour and

social-legislative conditions for the utilisation of this type of offering from the higher education institutions.[18)]

Increasing internationalisation

The modern academic world is committed to universal goals and therefore always has an international orientation. In reality, however, the academic pursuit has up until now been carried out predominantly within a context shaped by the cultural and political administration of the nation-state. In recent years, an intensive debate on internationalisation has unfolded in Germany. This discussion has already led to initial changes. However, the efforts of recent years have frequently lacked resolution and long-term perspectives.

Measures for promoting international scientific co-operation, exchanges and increasing the appeal of German institutions of higher education for foreign students and academics are necessary and must be strengthened further in future. For its own long-term interests, Germany must become a country of immigration for exceptionally qualified foreign students and academics. The network of co-operation and exchanges, which has long existed, should now be used far more intensively and consciously in order to achieve this. So, for example, the higher education institutions in the new German states should use the establishment of new academic facilities and existing contacts to become more attractive to highly-qualified students and academics from the countries to the East of them and the CIS region. The *Wissenschaftsrat* considers it also sensible and worthwhile from a general political point of view for the Federal Government to provide substantial monetary support for such activities.

The international marketing efforts of higher education institutions must to a much greater degree than at present make use of the increased introduction of modern information and communication technologies to offer study opportunities worldwide. Establishing outposts of German higher education institutions abroad, possibly in partnership with higher education institutions in the host countries, is one of the ways in this process of opening up German higher education institutions internationally can be underpinned. For many reasons, German higher education institutions have not previously been in a position to pursue this promising method of internationalisation. The *Wissenschaftsrat* feels that the

18) *Wissenschaftsrat*: *Stellungnahme zum Verhältnis von Hochschulausbildung und Beschäftigungssystem*, Würzburg 1999.

success of the institutions of higher education in creating the preconditions for this method, which has already been successfully applied many times by other countries, would provide an indication of the real autonomy of those institutions. Another important reason to actively pursue this course of action is the potential source of income the German higher education institutions would acquire from foreign educational markets. In addition to this, the direct competition of German institutions with foreign higher education institutions will have an invigorating effect on the internal reform process of the higher education institutions in Germany.

The content aspects of internationalisation is frequently reduced to promoting courses taught in foreign languages, but otherwise largely unchanged. There is no doubt that German higher education institutions must provide increased opportunities for study in foreign languages. English is today essentially more of a skill than a foreign language. And precisely in the sciences it has become the customary and indispensable international lingua franca. The mastery of further languages is also increasingly gaining in significance. However, the international opening of horizons which goes along with offering foreign language study opportunities is not sufficient. for the ability to cope with the daily challenges which academics and graduates of higher education institutions are increasingly encountering in international and multicultural career settings must now be imparted together with a deepening understanding of their own and foreign cultures. Linguistic proficiency is only a way in, and indeed one that often remains at the surface.

Herein lies a special task for the humanities and social sciences in the future. The humanities and social sciences can make an important contribution to coping with challenges posed by the increasing internationalisation of the future world of work, either by making available internationally oriented vocational study opportunities linked to their own spectrum of disciplines or by developing study modules which can be integrated into vocational courses of study, e. g. in economics or the engineering sciences. Possibilities of co-operation in this area between universities and *Fachhochschulen* should be utilised wherever possible. The traditional alignment of course content in the humanities and social sciences with the requirements of the civil service has already relaxed in many respects. The successful acquisition of new fields of employment outside the public service was, however, previously predominantly left to the initiative of the students of these subjects. In future these efforts

should be backed up by the development of innovative study opportunities.

There are new tasks and prospects in the area of the humanities and social sciences research, also. Research in the humanities and social sciences promotes competencies in acquiring and applying knowledge and contributes decisively to the development of modern societies. Such research is able to draw up a large portion of the knowledge and interpretation reserve on which modern societies, with their orientation towards economic reality, draw to maintain their functional and decision-making capacity. The processes of internationalisation currently ongoing in many areas of society must therefore be accompanied by a broadening of the subject spectrum in humanities and social science research to include an international and intercultural dimension. At the same time, new and comprehensive forms of interdisciplinary study should be tested and used.

Acquisition of inherited national traditions and identities through research will continue to be an important responsibility in the future, in particular for the humanities. National traditions and identities have an irreplaceable role in maintaining societal cohesion and stability in a situation of radical social and economic change. National traditions and identities can only play this role, however, if when they are recorded and explored in an academic context there is also consideration given to the emergence of new, or the re-emergence of old, traditions and identities that are not congruent with the framework of the modern nation state. Efforts in this direction cannot and should not be made by state decree. Above all they are the organisational responsibility of the academic community itself, determined by the structures of the respective discipline, structures that which can and must be developed further. The new cultural orientation currently taking place in multiple forms in many areas of the humanities and social sciences points in that direction.

The task of opening up an international dimension to the humanities and social sciences cannot be undertaken solely with a view to Europe or the area to which it has always been closely connected in numerous ways, North America. The economic and social development of nations and cultures outside the Atlantic region took place for a long time under the influence of Euro-American dominance. This dominance is disappearing and transforming itself increasingly into a competitive relationship, in which the European Union sees itself confronted not only with economic and political, but also with new cultural, challenges. Europe is

poorly equipped to deal with the challenge of this intellectual debate due to its long political and economic dominance. The humanities and social sciences are the areas of academic study in which these challenges can and must be met. In this context, one must be aware that in order for higher education institutions to continue to attract students and scientists from newly industrialised countries outside of the Atlantic region, the latter must encounter not only a stimulating academic environment in their subject at the higher education institution, but also an intellectual receptiveness to their culture. This open-mindedness, which is an important basis for the attraction of the American higher education institutions for students and academics from these regions, reveals itself in many everyday aspects, but it also possesses an intellectual dimension which it is valid to explore.

Initiatives towards new, trans-national institutional structures, as a complement to national academic systems, have emerged at European level in the past few decades. These initiatives must be reformed and vigorously developed further. The goal should be to strengthen the European institutional level so that the prospects for co-operation can be better utilised, without impairing the functionality of the national systems of higher education. At the same time, the institutional capacity of European research for integration with research endeavours outside Europe must be improved. The goal is not to create a centralised European academic sphere. The strength of the European academic world is its variety. While crucial to the ongoing organisation of the European academic sphere, the subsidiarity principle does not only mean maintaining and strengthening the functionality of national and regional academic spheres. It also means that synergy effects realised through joint European activities should be utilised as much as possible and actively appreciated as opportunities. In this way they can lead to a gradual Europeanisation of national institutions. Germany, as one of the leading members of the European Union, bears a special creative responsibility that it must assume in close and future-oriented co-operation with its partners in the European Union.

There is a particular need for reform in the Commission's research support. The European framework programmes are determined by economic objectives on the basis of the treaties. They serve to promote the competitiveness of the European economy and to redress structural imbalances within the European Union. Research sponsorship by the Commission, in particular within the framework programme, is often of the subject of criticism at the present time in Germany. In the view of the

Wissenschaftsrat this criticism, though in part thoroughly justified, fails to take sufficient account of the fact that the basic structure of this type of research support is determined not by the Commission itself, but by the member states. That is why efforts to achieve constructive further development in this regard must be raised at both the European and the national levels.

In the course of further development of the institutional structure of the Union, there will also be the chance, via the framework programmes, to redefine the role of Commission's research support role. The long-term goal should be to enable the Commission to develop its own framework programmes under the control and responsibility of the European parliament accompanied by independent academic advice. At the same time, the mobility programmes for students and academics, in particular, must receive substantially higher financial support than has hitherto been the case. Programmes that take specific account of the reality of the different capacities of national systems of higher education and research must play a more important role in the future, in a newly expanded Union with zones of different integration rates.

At European level, too, there must be a clear separation of responsibility for programme definition and programme execution, in the interests of reducing the costs of programme management. The member states should withdraw as much as possible from the detailed control of the framework programmes. The offices of the Commission should be allowed to reduce the costs of programme administration—which are often still too high – by delegating the routine administration tasks of research programmes to service providers suited to the purpose. It is conceivable that in this way a network of agencies for applied research at the European level might also emerge which could be linked to existing national networks.[19)]

Creation of an independent body for the increasingly significant area of higher education policy advice for the Commission should be considered. This body would have a manageable number of members, and the academic community, industry and member states would be represented at the highest level. Moreover, this body would take over fully from the present multiplicity of advisory committees. The current duality of responsibility of the Commission and the member states, together with the unsatisfactory way in which academic advice is incorporated as part

19) See above, p. 19.

of the definition and management of framework programmes, complicates and obscures the support process. Legal obstacles that would stand in the way of this tighter role for the commission can and should be eliminated by joint actions on the part of the member states. By making funding structures for the framework programme a subsidiary task, it should be ensured that that the academic systems of the member states continue to play an appropriately strong role for a long time to come.

The goal of promoting academic excellence must increasingly be set alongside the goals of institution building and sponsorship of economic competitiveness through framework programmes at the European level. Pure research that is science-driven, proposal-oriented and committed to the maintenance of standards of academic quality, hitherto the preserve of national academic institutions, requires an institutional structure all of its own which is independent even of the Commission. This is a task which is complementary to the strengthening of application orientation in the national context. The concept of pure research in this context should be understood as broadly as possible. It should embrace both knowledge-oriented and application-oriented pure research, it should incorporating both research in the natural sciences and engineering sciences as well as research in the humanities and social sciences. The creation of an institutional structure for European sponsorship of pure research must take place step by step. Initial steps in this direction for instance, in the framework of the European Science Foundation, have seen only slight development thus far. However, these approaches could be used in order to also further develop, in accordance with the named criteria, one of the existing national organisations for research sponsorship in such a way that it is given its own institutional structure. Above all, however, a new institution of that sort would require appropriate funding. A certain percentage—5-10 % of the funds expended under the framework programme is conceivable—from the budget of the European Union could be also be placed at the disposal of this institution.

The process of European integration, as well as the growing international interconnectedness of the modern academic community, also demands that the creation of research institutions by multinational European sponsorship should be pursued with greater determination and more frequently than has previously been the case. Trans-national, long-term groups of established National Centres of Excellence could be a first step in this direction. In this context, institutional mergers of national Centres

of Excellence should also be considered. The underlying legal conditions should be continually developed further to ease that sort of option for institutional development. The competitiveness of European research can be enhanced by that type of research concentration at the European level. This is also true with regard to American research to which especially close relationships have traditionally existed. But, it is also true in relation to the rapidly developing systems of higher education outside the Atlantic region. There is no conflict between continuing to maintain crucial and traditionally intense academic relations with the USA and Japan whilst at the same time placing greater emphasis on joint European activities. European research facilities can not only contribute to increasing the competitive performance of European research vis-à-vis the USA and Japan, but can at the same time ensure that the increasingly attractive opportunities for co-operation with the academic community outside the Atlantic region are better utilised than ever before. Here, too, Europe is in competition with the USA and Japan.

In principle, multinational European research facilities should be subject-focused and only be established where competitive international structures already exist. This should include the area of industrial co-operative research. Attention should be paid to dovetailing with powerful European universities with regard to teaching content of an international nature. When establishing these facilities, considerations that stem from national political thinking and structures should always be excluded. Funding from the structural funds should be enlisted to a greater extent to redress the structural imbalances among the academic systems of the member states.

The establishment of multinational research facilities in and around or in connection with national centres of competence can, and indeed should, contribute to raising their profile and international appeal even further. It is conceivable that by this method a network of European multinational-funded centres of competence could be developed in the medium-term, for which then a comprehensive institutional umbrella could become both sensible and necessary. The *Wissenschaftsrat* considers it both possible and useful for multinationally organised and funded research organisations to emerge in the near future in the European Union such as already exist at the national level—somewhat similar to the Max Planck Society or the Fraunhofer Society, for example.

Use of information and communication technologies

Organised on the basis of a division of labour and methodical progression, modern academic and scientific study builds on the available inventory of recorded knowledge and continually expands upon it. With the introduction of modern information and communication technologies, the established methods for communicating science and academic knowledge are undergoing lasting change. In essence, there are two different developments:

Division of labour and co-operation in research were previously to a large extent dependent on the direct spatial proximity of the participating academics. This corresponds to the paramount role that the spatially fixed institution has played in the previous development of modern research and continues to play today. In connection with the introduction of electronic means of communication and technologies, the local tie to a specific institutional location has loosened significantly—in research, teaching and in study. Digital media are increasingly utilised for investigations into existing knowledge and the production of new knowledge. The spatial connection of the academic to libraries, higher education institutions or research institutes is diminishing. Integration in inter-locational and inter-institutional working relations on the basis of modern electronic communication is gaining more and more in significance. It is already commonplace today for academics from the convenience of their workplace to be able to explore worldwide in libraries and databases that contain information about the questions they are working on. In increasing measure they are working jointly with colleagues from other institutions or academic systems on the solution of scientific problems. In doing so they have an opportunity for specialised research that their own institute cannot offer.

The traditional local connection that is diminishing in research is also loosening in teaching. The broad and continually increasing spread of modern electronic means of communication and technologies enables teaching sessions that require a student's or teacher's physical presence to be supplemented or completely replaced by forms where knowledge is conveyed using modern technology. This factor is expanding the effective sphere of influence of the higher education institutions. Internationality has been one of their characteristics since the Middle Ages. The degree of internationality of the institutions of higher education was, however, essentially always limited, not least because of the limited mo-

bility of the academics and students. It is only now as electronic-based forms of information storage and transmission are being introduced that institutions of higher education have the potential to become centres where knowledge is imparted worldwide. The advance of modern information and communication technologies has also certainly enabled other institutions to penetrate into the sphere of knowledge communication, which in the past the higher education institutions had reserved for themselves. Alongside private providers, these might also be, for example, research facilities that would no longer have to make extensive investments in buildings or personnel to become involved in teaching; they simply have to build on the technical communications structures created for their area of research. Increasingly, students are being given the opportunity to partake of the courses of study being offered at other higher education institutions, both at home and abroad. The ties binding students to their local higher education institution will loosen as institutions of higher education become networked worldwide and the requisite conditions become generally available. The accessibility of opportunities for study worldwide will lead to higher education institutions increasingly having to assert themselves against national and international competition, both with respect to academic quality as well as technological forms of transmission. This is linked of course with the possibility of gaining students from other institutions of higher education.

The change of forms of communication in the academic sphere—initiated by the spread of modern information and communication technologies but also favoured by a number of other factors—is a very dynamic process. Prognoses regarding precise developments over the next 10 to 15 years are therefore only possible with significant qualifications. It should also be noted that on the basis of the worldwide character of this development, the scope for intervention or structuring efforts on the part of national higher education policy is very limited. The entire development is unplanned and is placing the national systems of higher education and research under great pressure to change, but without there being a new, stable and basic structure for scientific and academic communication already developed at the international level, that would give institutions some sense of security about the course they choose. The *Wissenschaftsrat*, however, feels that there are indeed some points of orientation and options for action that are recognisable at this stage. These should be considered in the context of the continued progress on implementation of modern information and communication technolo-

gies, and should become the basis for activities under higher education policy:

The essential prerequisite for participation in scientific and academic communication, given the growing use of modern information and communication technologies, is for the entire system of higher education and research to be equipped with modern computers and communication technologies. Efforts in this direction have already been undertaken in recent years. These efforts must be significantly increased in view of the rapid rate of technological development. Research facilities, in particular the universities, must be at the cutting edge when it comes to the use of modern information and communication technologies. Independent of their field of study, the future graduate of the higher education system must possess the capacity to play a part in introducing this technology into their professional situations. Comprehensive competence, including the technical prerequisites, must also be acquired and practised at the research facilities and higher education institutions by having students work with the latest computer technology. One of the prerequisites for this is that the teachers at the higher education institutions also continue to build on their media competence.

The goal must be for every academic and every student at a German academic institution, on the basis of state-of-the-art technology and equipment, to enjoy the broadest possible and most cost-favourable access to all of the knowledge resources available worldwide in electronic form. This also requires that access be created to the still considerable academic resources not yet available in electronic form. Vigorous steps must be taken to create a comprehensive catalogue of all available media inventories at German academic facilities. Available academic resources must be converted to electronic form wherever possible and economically justifiable. At the same time, the challenges represented by electronic publications, which are gaining in significance, must be met. In particular, the long-term archiving of electronic publications is a problem that has yet to be solved satisfactorily.

In the future the task will be to organise knowledge, which will, in principle, technically be available everywhere and at all times, in such a way that it remains easily comprehensible and at the same time retains its proven academic standards of quality. Consequences clearly arise for the future role of libraries and comparable facilities. These must be developed further into centres of academic knowledge management which, alongside the task of storing available knowledge, will also and especial-

ly assume knowledge organisation and thus content-oriented functions. The libraries are for many reasons not in a position to do that at this time. They lack the necessary materials as well as the staff resources. The previous strict institutional distinction between libraries, comparable facilities and institutions responsible in a narrower sense for research and teaching must be relaxed. In future it will be an essential task of the institutions responsible for research and teaching to create and continually maintain access portals, in close co-operation with libraries and other public facilities for storage of knowledge and information-conveyance. These will be portals to knowledge available in electronic form, content-orientated and organised along qualitative principles. The appropriate resources must be made available for this task.

It is already clear something new is emerging as a result of the introduction of modern information and communication technologies alongside the classic ways in which the academic sphere and society interact via education or via the direct transfer of research results from producer to user. As the importance of knowledge to economic value added activities and at the same time knowledge becomes increasingly available thanks to the use of modern information and communication technologies, so also does industry's need for services in the area of knowledge organisation and advice. Knowledge is becoming a marketable commodity to a much greater extent than has previously been the case. The higher education institutions and research facilities should grasp this as an income-generating opportunity. Founding companies specialising in knowledge exploitation, perhaps jointly with partners from industry, might be a suitable method. The current legal parameters restrict the freedom of academic institutions that wish to engage in commercial activities, in some cases to a significant degree. These conditions should be adapted in order to make such activities easier and to give the academic facilities attractive income-generating opportunities. It should, of course, be ensured that the institutions actually keep hold of this income.

The new opportunities for division of labour and co-operation in research that arise from the increased use of modern means of communication require sustained support. Direct physical proximity will continue even in the future to be an especially favourable prerequisite for high academic productivity. Thanks to Internet technology, however, the communications network of the researcher can be much more extensive and differentiated than has previously been the case. The institutions sponsoring academic study have failed to respond adequately to this development so far. In future, it will be essential to provide sub-

stantial financial support to virtual co-operation in research that goes beyond a given location.

Preparation for employment in research and teaching as well as for academically sound vocational employment outside the academic world is always a complex socialisation process and therefore demands personal contact between teacher and student that promotes reasoning and judgement. The closer teaching is linked to research and experiment, the more this applies. Higher education teaching and studies cannot permit the transmission and acquisition of information to be reduced to processes mediated solely by technology.[20] Also the structured imparting of information represents an essential part of higher education teaching. This applies as much to the teaching of recorded knowledge and to the established methods in the framework of fundamental studies to post-graduate studies as it does to further and continuing education, an area that must be expanded in future. The modern information and communication technologies open up great scope for further developing and professionalising this area of higher education teaching—only sporadic attempts have been made thus far. Electronically based, didactically sound imparting of the established knowledge-inventory is an opportunity to achieve improved study conditions, in particular in high-volume subjects, such as the legal sciences or medicine, where the student's does not encounter current research material until a relatively late stage. Any lightening of the load in the area of teaching as a result of the implementation of electronic media should certainly also be used to help to renew the significance of the personal element, traditionally counted among the strengths of German higher education teaching, a significance which has been lost in many locations in the course of the quantitative expansion of the higher education institutions in the last decades. Imparting knowledge on the basis of personal contact between teacher and taught and imparting knowledge by electronic means are not two mutually exclusive routes. They are complement one other.

Imparting techniques for methodical information collection and evaluation is part of every academic and academically sound education. The importance of such educational elements will, however, significantly increase as information gateways widen as a result of the use of digital media. The capacity for methodical information gathering and evaluation, under these conditions, will represent a key qualification in the job

20) Jürgen Mittelstraß: *Der Verlust des Wissen*, in: same: Leonardo-Welt: *Über Wissenschaft, Forschung und Verantwortung*, Frankfurt am Main 1992, p. 221 ff.

market. Higher education teachers must take this into consideration to a greater extent when developing suitable educational modules. Given how rapidly knowledge now ages, this will also represent one of the central tasks in the realm of continuing education that higher education institutions should take on in collaboration with industry.

It would be a mistake to see the implementation of modern information and communication technologies in teaching primarily in terms of cost considerations. The development of suitable digital curricula and teaching materials is only just beginning. It will require significant financial efforts in the coming years in order to turn modern information and communication technologies into a useful auxiliary instrument of higher education teaching. Learning and process research, still underdeveloped in Germany, must be strengthened to this end. In this connection, many new opportunities for co-operation will emerge both between the information and communication industries and academic institutions and also among the academic institutions themselves. A new field of applied research and development is opening up, rarely addressed up to this point, namely that of collaboration between *Fachhochschulen* and the universities.

The *Fachhochschulen* primarily fulfil tasks in the area of knowledge communication—in the course of which they are dependent upon close contact to both social practice and research in their teaching areas. On the basis of their mission, they have particular experience in the realm of didactic implementation and imparting academic knowledge. This experience should be used to the full in the development of digital learning materials, in combination with the universities, which satisfy both academic and didactic demands. The founding of 'virtual higher education institutions' and universities on a combined basis, such as those already functioning in certain places, is a suitable method for gathering experience on the use of new media in higher education teaching. This development should also be promoted actively in the interest of raising the international visibility of German higher education. Alongside those efforts, partnerships should also be established with foreign higher education institutions, in particular those from the member states of the European Union. Joint development of digital English-language model curricula for a representative selection of disciplines, subjects and qualification levels should be supported through funding from the Federal Government and the states and awarded by competitive tender.

With the development of teaching opportunities in co-operation with the information and communications industry, but also with academic publications, the academic institutions will be fulfilling their responsibility to provide quality assurance. This task will gain in significance in the course of the general implementation of modern information and communication technologies. However, the danger of disorientation and arbitrariness will grow in proportion to the rate at which electronic teaching opportunities and publications gain acceptance and information and knowledge, once scarce, becomes a universally available and easily accessed commodity. In the view of the *Wissenschaftsrat*, there can neither be restrictions on the emerging market for modern electronic teaching opportunities and electronic publications from regulatory measures, nor can there be any attempt to delimit the potential diversity of academic teaching. For that reason, however, the higher education institutions and other academic facilities must in future and to a greater extent than they did in the past, ensure that the standards of academic quality are both elucidated in public and rendered transparent. The increased use of resources required for performing such tasks, together with the necessary, yet still not sufficiently developed, organisational measures, are worthwhile. Those institutions that acquire long-term confidence and reputation across their direct area of influence and beyond, through rigorous quality assurance, under the conditions of a general implementation of modern communication technologies, will have a special opportunity for success in the international rivalry among academic facilities. The special role and responsibility of the publicly financed institutions of higher education would certainly not rule out partnerships, including business partnerships with enterprises from the information and communications industry. Quite the contrary, that special role is the very basis for such partnerships. Teaching supported by the latest information technology and electronic publications will only have the prospect of lasting commercial success if their quality is assured. And this can only be assured by the academic institutions themselves, which should consequently retain a significant portion of the income derived from the commercial exploitation of knowledge.

Profile building, performance differentiation and permeability

In institutional terms, the German system of higher education and research is starkly differentiated. Task-related institutional differentiation makes sense and should essentially be maintained into the future. It allows the state to provide targeted base financing and to act in the context of a long-term regulatory framework. It also ensures that institutions of higher education enjoy security of planning and action. However, the established institutional differentiation of the German higher education and research system needs to be expanded to include function and performance-related elements—which can help bring in greater flexibility and optimise the institutional structure.

In actuality large profile and performance differences between the institutions in the individual parts of the higher education system and research are already recognisable. Only a few universities, for example, are in a position to offer the full range of subjects in research and teaching at a high level and to be competitive internationally. The varied successes in soliciting funding from the DFG, which constitutes a proven indicator of the intensity and quality of research activities at universities, indicates that research does not always enjoy the standing it should be accorded by virtue of the institutional task definition of the universities. At the same time, there are individual *Fachhochschulen* that generate external income, which points to excellent research activities. Performance differences of this type are also evident within the universities themselves. Faculties with only minimal research activities stand in contrast to those that are very active in research, specialist areas with a high teaching load and performance stand side by side with those where this is not the case.

The non-university sphere of research also offers a similar picture of variety and qualitative variance which does not correspond to the schematic categorisation of institutions. In certain areas of pure research, for instance, many of the Blue List institutes or the GFEs operate at the same level as some of the universities and the Max Planck Institutes. And the Max Planck Institutes are operating in some areas, such as legal research, that have traditionally belong to the core inventory of university research since the task of the Max Planck Institutes is defined above all as precisely those areas which cannot be dealt with at the universities. Some GFEs carry out research which closely corresponds to market conditions and which overlaps with the activities of the Fraunhofer Institute.

In the view of the *Wissenschaftsrat*, the present over-emphasis on general institutional function- and status-assignments leads to a situation in which the differentiation of function and performance profiles—which are clearly recognisable today—are frequently ignored and, not infrequently, resources reach the wrong place or flow to poor-performing areas. It is all a question of exploiting the possibilities inherent in the actual differentiation of the function profile and performance of the academic institutions that make up the system.

Redefining their position in the total structure of the science system according to function and performance-oriented criteria will require the efforts of each individual academic institution. The higher education institutions and research facilities must identify strengths and weaknesses in their own function and performance-profiles. The central and strongest performing area for the specific profile of a facility must become the starting point from which further planning and internal resource decisions are made. It is also makes no sense for resources to be used in areas that over time have proven to be incidental to the institution's profile or low-performing. External evaluations can support this process but cannot replace it. Development potential is an important point to be taken into account by higher education institutions and research facilities when deciding their own future course. Higher education is all about risk. It would be a mistake if the higher education institutions and research facilities orientated themselves exclusively according to generally established relevance and performance criteria when re-designing their function profile and performance spectrum. Profile forming and concentration on strong performing areas require detailed examination of aspects of the current enquiries in research and teaching, but they cannot, be restricted within an academic institution that simply to that which is customary and in demand. Interdisciplinarity in research and teaching is at the same time one of the most important opportunities in any profile building exercise.

To text existing strengths and weaknesses functional performance parameters differentiated by quality level that take into account the full spectrum of functions assumed by an academic institution. The widespread differentiation between various types of research and teaching is not a universally binding ranking of academic activities. It represents simply a statement about different functional dimensions within the higher education system and research—each of which requires specific performance parameters. In those areas, for example, where teaching serves as a preparation for a profession outside science, different standards are app-

lied from those in the sphere of teaching intending to lead to the professional academic. For internationally competitive pure research, different performance criteria apply than for contract research, which is closely associated to economic reality. Discrepancies between function profile and actual performance on the one hand, and the function- and status-designation of a facility or of parts of a facility on the other hand must in no way signify that there is poor performance. It will often be more likely that there will indeed be performance, but performance of a different kind from that derived from the institution's current functions and status-designation. In future the principle of resource allocation will be for resources to be awarded on the basis of actual function and performance profiles. Consequences that may arise from profile building and performance differentiation are:

– Targeted expansion or closure of facilities or sections of facilities

  Profile building and concentration on areas that are performing strongly are frequently discussed in a defensive fashion, as though it were always a question of reducing costs or irreplaceable closures. This is not the case. It is about isingoptimising resource allocation. A decision to discontinue operation of a given institution or section of an institution is therefore always a positive decision in favour of other institutions or sections of an institution.

  Profile building and concentration on areas that are performing strongly may of course, and must in specific cases, mean the actual closure of poorly-performing facilities or parts of facilities—and when that happens the possibility or necessity of preserving institutional competence must always be considered. It is shortsighted to hold onto facilities, or sections of facilities, who make little contribution to the institution's profile or to hold onto those that have repeatedly demonstrated clear performance deficits over a long period of time. It means that the resources tied up by such a facility or section of a facility are withheld from other better performing facilities that are adversely impacted for the long term with respect of their potential development. All in all, it makes sense in all areas of the higher education system and research for research facilities only to be set up on a fixed term basis and a limited mission and as long as no long-term time perspective is required for major technical plant.

  Recognisable increase in demand is an important point which is to be considered in connection with any thoughts of closure. This is particularly true in those areas of university research and teaching,

which, as with the example of university-based medicine, are defined by very stringent legal specifications and subject to pronounced governmental regulation with respect to the job market. It makes no sense whatsoever for the government to weaken the fundamentally better academic development potential of a small number of competitive facilities by continuing to promote, over and above any tangible need, a larger number of facilities that are less able to compete. Having the courage to make decisions once strengths and weaknesses of higher education institutions have been identified, is not just required of the institutions themselves, but also of the governmental sponsors.

– Transferring facilities or sections of facilities to other sections of the higher education and research system

  The institutional structure of Germany's higher education and research system is not sufficiently permeable. The dynamic of academic development often leads institutions of research and teaching beyond the limits of their assigned functions and status. However, not infrequently it proves almost impossible to change the designated function and status categorisation of facilities or a section of these facilities, even when there are many substantive reasons to support such a change. Closer institutional linkage of Blue List institutes and other non-university research institutes with the universities, which has been discussed time and again and in many cases is also objectively possible and sensible, frequently fails solely as a result of rigidity in existing regulations in the sphere of the higher education institutions and non-university research. The institutional status of the various parts of the higher education and research system (which are not unjustifiably labelled 'pillars'), in many cases established simply on the grounds of specific historical conditions which are no longer relevant today, is frequently defended even when there are substantive reasons against the continuation of the institutional status quo.

  Opportunities to achieve resource allocation on the basis of function and performance which lie in transferring of facilities or sections of facilities to other institutional areas of the higher education and research system should be used to a far greater extent than has been done in the past. In doing so, no area of the higher education system should be ruled out from such changes. This applies to universities and non-university institutions in equal measure. Prepara-

tions for such a transfer must be promoted through clear financial stimulus.

– Further development of the existing framework of institutional differentiation

  The framework of institutional differentiation that exists today has in essence proven itself worthwhile. Greater accentuation of actual function and performance profiles when defining the position of the research and teaching establishments within the higher education system may, however, in future make it absolutely necessary to reconsider not only the categorisation of individual institutions, but also this framework. At the same time, there is no point in rushing to change the existing framework of institutional differentiation without first thoroughly weighing up of all aspects relevant to the decision. Enhancing operational flexibility and interlinkage of the individual sections of the system must be at the forefront of any efforts to mobilise the potential of the German system of higher education and research. In particular, however, in view of the rapid changes in the context of globalisation and European integration, consideration must always be given to the possibility of fundamental regulatory changes.

Increasing mobility

An academic system in which function profiles and performance play a significantly greater role in defining the position of an institution within the system as a whole will be significantly more varied in shape and form than the one we have today. The almost exclusive orientation of the structure of today's system of higher education towards general points of differentiation based on general function and legal form levels out differences in function and performance among the academic institutions, but also within them. Awarding of resources according to general institutional criteria of functional differentiation contributes both to the inflexibility of poor performers and the demotivation of strong performers.

A system of higher education and research based to a greater extent on differentiation according to points of function profile and performance will demand and enable a far greater measure of mobility from academics and students than is the case today. In a system of higher education

and research that is developed further in that way, the course of study of the individual student and the career of the individual academic depends to a far greater extent on the student and the academic having to make decisions about which direction he or she wishes to pursue. Association with an institution would not automatically guarantee that a particular educational or career goal can be attained. It will be necessary for the individual, at different moments of his studies or his academic career, to select the institution that is best suited to his or her specific situation.

This freedom of choice and the personal mobility associated with it, as a decisive prerequisite for a flexible and strongly innovative system of higher education and research, has suffered up to this point because of the large number of restrictions in place. An important contribution to student mobility would be made by the development of uniform courses and qualifications with universally binding certification standards tied in with the increased integration of the European Union. And permeability between the various courses and qualifications must be an important goal in the context of that process. The present phase of transition and of experiment should be utilised in order to find a course and qualifications structure that is in step with the times and in step with the requirements of the academic and above all non-academic job markets. The goal of this phase must, however, be to once again establish generally binding course and qualification structures. Such a standardisation does not stand in the way of diversity, but it is the prerequisite for facilitating student mobility and also for ensuring that the diversity of study opportunities that the federal character of the higher education system makes possible can actually be used.

The conditions underlying the job market for academics are currently under discussion. Because this discussion also touches on the area of responsibility of the Federal Government and the states and is linked in multiple ways with general labour and social legislative questions, it is to be assumed that the necessary far-reaching re-organisation will take some time. The goal must be for the new regulation to reflect the characteristic features of the job market for academics and to eliminate current obstacles to mobility:

Competition among academic institutions is assured as long as the institution can recruit the academics suited to its specific function profile and performance spectrum. The institutions therefore depend on the mobility of academics. The differences in sponsorship and funding sources

among academic institutions can no longer be an obstacle to the mobility of the academic. The question of, for instance, sharing the pension burdens between the host states of the universities concerned should no longer play a role in appointment decisions. It must become a matter of course, for example, that an employee of a GFE, predominantly funded by the Federal Government, or a Blue List facility, jointly supported by the Federal Government and the states, to be able to switch either temporarily or permanently to a *Fachhochschule* or a university as needed and on presentation of the requisite qualifications, without being hindered by formal regulations. This degree of mobility will probably only be achieved through the creation of a standardised legal framework for service, compensation and pension, in which status differences, such as those that currently exist between civil servants (*Beamte*) and employees (*Angestellte*) are removed.

In the academic world projects of different duration determine work patterns. Highly mobile academics are just as important to academic institutions that are starting projects as to those that want to end projects. Temporary employment contracts correspond best to project-based academic activities. Today, there is already a comparatively high proportion of temporary employment contracts; these are used, however, almost exclusively for the employment of the new generation of academics. The proportion of temporary employment contracts must be increased further over and above the group of the new generation of academics because this is a prerequisite for increasing the flexibility of the higher education and research system. The often mechanically administered legal regulations pertaining to time limitations should certainly be reconsidered. The actual needs of research and teaching should be the decisive factor when agreeing employment terms.

Mobility must be rewarded and be worthwhile. Higher education institutions and research facilities that compete for the academics best suited to their needs must be in a position to offer attractive salary conditions tailored to the individual situation. High degree of personal mobility, diverse experiences in academic institutions at home and abroad and excellent performance must be clearly reflected in the salary conditions of the academic. This applies generally; however, it also applies in specifically when the competition for qualified academic personnel is international. Universities, the Max Planck Institutes and other academic institutions participating in international competition must be in a position to orientate themselves to the normal international standards for compensation in their respective specialist area. Global budgets must ta-

ke this into account and must not make the facilities incapable of action. Regulations pertaining to the rights of foreigners must also be adapted in such a way that they allow the unhindered mobility of especially qualified scientists from abroad.

In the interest of strengthening the application orientation of the higher education and research system, it is essential that no new hurdles be erected when reformulating the framework conditions of the academic job market, effectively cutting it off from the general job market. The transfer of personnel between the academic community, industry and administration, which is an important prerequisite for strengthening the application orientation of the academic system, is still underdeveloped in Germany. The question of compensation also plays a pivotal role here, especially with top positions. Academic institutions must also be able to win specially qualified personnel from industry by offering attractive compensation. At the same time, efforts must be made to ensure that academics retain and utilise to the broadest extent the option of spending certain periods working in industry or also in administration.

Internationalisation and in particular, European integration, which is rapidly and dynamically gaining in momentum, demand above all that support be given to the mobility of the new generation of academics. Given the long qualification cycles in an academic context, the international competitiveness of the German higher education system and research over the next 15 years, for which the increased international mobility of German academic is an important prerequisite, will essentially be decided today. And so rapid action is necessary. Today it is already normal in many areas for young academics to spend part of their qualifying phase in a foreign institution of higher education or research facility. This should become the rule in all areas of science as soon as possible. Whenever possible, only academics with intensive work experience at and with recognised foreign academic facilities should be appointed to professorships and other leading positions. The structure of the qualifying phase and the possibilities of financial sponsorship should be adapted accordingly.

Encouraging competition and co-operation

Competition

Strengthening institutional competition is an important instrument for offsetting the previous overemphasis on functional differentiation in the German system of higher education and research. Profile building and performance differentiation on the part of the institutions will only be possible competition is successfully promoted.

The intellectual competition among individual academics and groups of academics to gain recognition or find the best solution to a given problem is the obvious precondition for any form of competition in the higher education and research system. But unless there is sufficient basic funding and resources even this competition cannot emerge. However, academics do not just need calculable financial and material resources for successful academic work. Good academic work can only prosper in facilities that offer a conducive institutional and organisational environment. This environment is improved by institutional competition.

There are already a number of instruments for the promotion of institutional competition, within the academic institutions as well as among them. These instruments must be expanded and utilised more intensively than they have been thus far:

Efforts towards sponsoring institutional competition rely almost exclusively on external mechanisms and agencies. The structuring function they fulfil for the higher education and research system has actually increased as funding for basic provision has actually fallen over recent years. This form of support for institutional competition is doubtlessly important and of great significance for the higher education and research system as a whole. However, in reality it can also result in actual structural decisions, which should be made within the higher education institutions or the research facilities, being delegated instead to external institutions such as ministries or sponsoring facilities. Such a weakening of the self-organisation capabilities of the academic institutions is not a meaningful development.

Strengthening institutional competition must therefore first and foremost mean that the competitive mechanisms within the academic institutions are strengthened. In this regard, academic institutions themselves are best suited to determine their actual function and performance-profile, which must of course be the basis for their successful participati-

on in competition for freely awarded external funding. Certain attempts to achieve greater flexibility in basic provisioning by structuring central funding within the individual scientific facilities, which facilities then award themselves according to performance criteria, should be considerably strengthened. Up to now this form of what is termed 'internal third-party funding' has been on a comparatively small scale. In future, its relative share of the total budget of a facility should be allocated in such a way that there is a clear incentive to make genuine efforts to obtain a piece of the pie. The introduction of global budgets offers favourable starting points for achieving this goal. The results of internal profile-building procedures triggered by internal competitive processes must form the basis for the profile-building process that is directed at inter-institutional competition.

Mechanisms for the promotion of competition among the institutions must also be strengthened. Expansion of cross-institutional state programme sponsorship becomes especially significant with regard to the need to improve the application orientation of the academic system (cf. Strengthening the application focus and connection to actual practice). The DFG will continue in the future to be the most important instrument for the sponsorship of competition in the area of independent research based exclusively on standards of academic excellence. The DFG will also need to increase the funding available if it is to fulfil its responsibilities adequately in future. It would be a mistake to assume that the need to strengthen the application orientation of the academic system means the DFG should reduce its financial efforts. The DFG's sponsorship function targeted to innovative academic work is the necessary foundation for strengthening the application orientation and a crucial contribution to the profile-building and performance differentiation efforts in which universities are engaged. This is particularly true of the programme for special research areas among one of the aims of which is structure-building at the universities.

The promotion of competition within and among the academic institutions will continue in the future to require primarily state funding. The *Wissenschaftsrat* feels, however, that private funding for the promotion of higher education can also be mobilised, over and above the amounts available in state funding. As additional agencies for the promotion of competition, private foundations and businesses not only contribute to reinforcing the processes of profile building and performance differentiation by making additional funds available, they also broaden the spectrum of promotional goals and criteria, and frequently represent an im-

portant institutional safeguard precisely for those innovative approaches in research that goes beyond the established academic mainstream.[21] The prerequisite for this much needed distinct increase in the flow of private funds into the promotion of higher education must be created by means of a corresponding and far-reaching reform of the law on foundations. The amendment of the law on foundations that has already taken place points in the right direction.

Co-operation

Increased participation in competition encourages each academic institution to focus on performance in the areas in which they possess particular skills. In turn, profile building and performance differentiation create both new possibilities and new necessities for institutional co-operation. These opportunities for co-operation must be used to a much greater extent than has previously been the case in order to bring together the various institutions that make up the publicly funded system of higher education and research as well as institutions that receive both public and private funding.

In principle, co-operative arrangements should be entered into on a fixed-term and subject-focused basis, but it is also conceivable to set up very long-term and multi-dimensional co-operative arrangements. Co-operative arrangements require their own administrative support, but these should be exclusively orientated towards achieving the co-operative purpose and never impinge on the organisational authority of the participating institutions. The spectrum of co-operative arrangements should also encompass virtual forms of communication.

The Federal Government and the states have an opportunity to develop the sponsorship of institutional co-operation into a second strategic line of academic sponsorship alongside the sponsorship of competition—above all in the context of expanding their application-oriented programme sponsorship. There is currently no sufficiently systematic promotion of co-operation.[22] The organisational and financial regulations

21) Dagmar Schipanski: *Foundations—partners of the universities*, in: *Interdisciplinary Science Reviews* 1996, Vol. 21, No. 4.

22) For the possibilities of forming co-operatives see, for example: *Wissenschaftsrat*: *Empfehlung zur Förderung materialwissenschaftlicher Forschung und Lehre an den Universitäten*, in: *Empfehlungen und Stellungnahmen* 1993, Köln 1994, p. 291 ff.

of the academic institutions are not infrequently configured so that predominantly people-related forms of co-operation, such as joint appointments, are possible. In the course of the systematisation and strengthening of institutional co-operation, the Federal Government and the states should develop model administrative regulations for fixed-term, subject-focused syndicates among different institutions within the higher education and research system such as already exist in the area of personal co-operation. Opportunities for co-operative arrangements should be used within individual states as well as between states and nationwide. The opportunities for co-operation across state borders have been especially under-utilised up to now. Additional financial support is an especially favourable instrument for promoting co-operative arrangements. But academic institutions should be looking for opportunities to engage in co-operative arrangements even when there is no additional funding directly associated with that activity. The synergetic effects achieved through the formation of co-operative syndicates can significantly raise the chances, for example, of attracting externally awarded third-party funds.

Expanding the opportunities of non-university institutions to apply to the DFG beyond what is already available, could be considered as a means of strengthening the co-operation of non-university research facilities with the universities in the area of independent research. Such a measure, however, would only make sense if it were accompanied by a corresponding increase in the funds available to the DFG for this purpose. Research at the Max Planck Institutes is also closely coupled with university research through DFG funds. The Max Planck Society should continue along this route; it was a method that was initiated to further strengthen co-operation with the universities by means of own funding.

The range of forms of co-operation has expanded in recent years. Co-operation among institutes of the Max Planck Society and universities in the form of deployed Max Planck Society working groups or joint graduate schools represents an interesting new approach, which should be pursued further and expanded. In future, however, forms of co-operation little explored until now, such as that between universities and *Fachhochschulen*, should also be developed further and intensified where they already exist. One possibility could be that a university, together with one or more *Fachhochschule* could form an internationally visible Centre of Excellence in a particular specialist subject of higher education teaching. By agreement and linking up their respective available teaching potential, a networked study opportunity could emerge in

the area concerned, which could be much more starkly differentiated than the offering of any individual facility both in respect to the subject and the educational goals. Also co-operation between universities and GFEs could be enhanced to a far greater extent than has been seen thus far. This would be an opportunity, for instance, for the GFEs to greatly expand joint doctoral courses of study or graduate level courses along with the universities. In the framework of expanded programme sponsorship of application-oriented research, it is also conceivable that subject-focused, fixed-term research co-operatives could be formed under the guidance of the GFEs together with the universities and partners from industry-based research. The majority of the Blue List Institutes have developed good co-operation with the universities in recent years on the basis of co-operation agreements and joint appointments. Suitable Blue List Institutes should, however, be more closely allied with the universities in the context of long-term partnerships than is currently the case. In this respect, better results have frequently been achieved in the new German states than in the old. There are many different aspects to improving the dovetailing of non-university research facilities with the universities. For example, when erecting new buildings for an institute, care should be taken that they are built on land neighbouring a university with an related specialist profile, if at all possible. When planning buildings for universities that are sponsored via the *Hochschulbauförderungsgesetz* (HBFG) (University Construction Act) efforts should also be made to achieve physical proximity to non-university institutes.

Virtual, non location-based co-operation within research and teaching will increasingly become an important form of academic co-operation, which in turn will require sustained financial support. However, the concentration of numerous different academic facilities at a single location will continue to be a factor in future that is especially favourable for achieving co-operative synergy. This is particularly applicable where, as in Munich, Stuttgart, Frankfurt, Hamburg, Berlin, Dresden or in the Ruhr area, for example, an exceptionally large number of different academic facilities have been established all in very close proximity to one another. This should be utilised for the formation of complex, regional co-operative structures, which also include private partners. As American examples show, the formation of such clusters yields an extraordinarily high development potential in research and teaching. Additional funding should be awarded to promote this development potential. As well as being a responsibility of the state that hosts this sort of institutional concentration, the Federal Government, which has already gained ex-

perience from similarly structured sponsorship processes, also bears a certain amount of responsibility. It would particularly make sense to link the expansion of application-oriented programme sponsorship with the sponsorship of such regional co-operation. Additional funds, to include infrastructure measures, should be awarded in the context of a competitive process. The prerequisite for taking part in such a competition should be that the participating facility puts a significant share of their basic funding into the co-operative project. Wherever possible, the guidance of such co-operative projects should lie with the universities. In order to achieve this, their organisational capacity and competency will have to be expanded significantly and utilised in a professional manner.

Enhancing autonomy

For the academic institutions to apply a performance-oriented focus to those areas in which they possess special strengths, for them to rise to the challenges associated with increased mobility among students and academics, as well as new and extended forms of competition and co-operation, they must be strong and have well developed capacities for self-organisation. The scope and capacity of many academic institutions in terms of autonomy is largely undeveloped at the present time.

The organisational forms of academic institutions are currently undergoing radical change. Essentially, the process involves transferring commercial organisational and management models to academic institutions. This modernisation of organisational and management models is necessary, because only then will the complexity of the management tasks that face modern academic institutions be truly reflected. In achieving this, however, the following points should be considered:

In principle, the principle of subsidiarity should apply to the organisation of higher education. Decisions should essentially only be taken by a higher organisational level, one that is therefore further removed from the practice of research and teaching, when a lower organisational level cannot cope. Organising the institutions along the lines of the principle of subsidiarity ensures that in general, wherever direct academic interests are at stake, it is the active academic who makes the essential decision. The present phase of radical change in the organisation and management of academic institutions should be used therefore to gather experiences in ambitious experiments. Unusual initiatives should also be discussed and, if they prove sensible, be implemented. There is

currently discussion of transferring universities to fall as entities under the auspices of foundations; that is precisely such an initiative.

Orientation towards the subsidiarity principle does not mean that the academic institutions can do without appropriate and professional administrative support. This is especially true of large-scale higher education and research facilities. In this respect, there has always been a weakness, especially in the universities, which persists today; namely the frequent inability to utilise their excellent potential in research and teaching because of a lack of corresponding capacities for self-organisation. Reinforcement of self-organisational capacities in all academic institutions, and thereby reinforcement of their autonomy, hinges on the reform approaches of recent years being carried out successfully. Strengthening self-organisational capacity does not mean that individual academics are to be burdened with additional administrative tasks. On the contrary, academic institutions that develop the potential to act autonomously and are active and flexible in response to their academic and social environment require professional management if they are to meet their burden of responsibility. Autonomy in academic concerns can only be successfully realised under the present conditions if the fact is recognised that the principles of peer management is no longer adequate for the multiple management tasks inherent in modern academic institutions. The transfer of administrative capacities and resources from the ministries and academic organisations to the academic institutions has already begun. It must be continued and, in the context of a development process, lead to experimentation with additional options.

The state has always been the most important sponsor of institutionalised academic activities. It must remain so in future. However, the state should also withdraw itself as much as possible from controlling the details of academic institutions. Indirect forms of control, by means of programmes, target agreements and global budgets, are the means appropriate to our times of reconciling the overarching responsibility of the state for the academic institutions, which will continue into the future, with the need to strengthen the self-organisational capacity of these same institutions. Attention must be paid to the reform of the role of the state in relation to the academic facilities so that they are not given merely formal autonomy rights. Autonomy for higher education institutions in a future academic system means, for example, that they are free to function as an employer with respect to their academic personnel. The dual competition of higher education institutions for students and students for higher education institutions will only be possible on the basis

of increased autonomy for the higher education institutions. Regulations such as capacity ordinances must be of a transitional nature only and must be set up for this interim phase in such a way that they permit all institutions and each individual institution to put in place differentiated regulations. In the long-term, these outdated control instruments must be dismantled completely and replaced with specific regulations in the context of target agreements which the state and the higher education institutions agree upon—in other words, target agreements regarding the number of students who could potentially enrol on the basis of academically appropriate supervisory relations; these are currently only found in the *Fachhochschulen*. In the view of the *Wissenschaftsrat*, there will be an opportunity for the higher education institutions in the new German states, in particular, with growing autonomy to assume the role of promoting the economic re-organisation of their regions. Given the crisis-like development of earlier industrially structures and the essential dismantling of all previous industrial research associated with that development, the universities have a great deal of scope for innovative knowledge and application-orientated pure research. This scope should also be used so that the research-related teaching, in particular, is enlisted as the basis for assessing teaching performance.

For the state academic administrations, indirect forms of control of academic institutions will mean first of all that they can, and indeed should, withdraw from routine tasks and responsibilities. However, such a withdrawal also places increased demands on their overarching control powers. Exercising these management powers calls for an improvement in the instruments of decision-making in higher education policy decision-making. The prerequisites for the state to function as the moderator of the higher education and research system are establishment of cost-effective processes for evaluating the performance of academic institutions in research and teaching, appropriate to the characteristics of the academic sphere and its various specialist cultures, as well as establishment and utilisation of prospecting mechanisms. State evaluation and prospecting mechanisms should be based on the ones that the academic institutions themselves will need to establish as they strengthen their capacity for self-organisation. However, the improvements in instruments and processes for decision-making in higher education policy can never replace the policy decisions themselves, nor indeed should it. Concrete decisions, for instance, about the allocation of resources can and must always be a result of negotiation processes between the scientific faci-

lities and state sponsors only.[23] When developing newer processes for performance assessment and quality assurance, to include the sphere of teaching, care must be taken that these are implemented in a transparent fashion and always appropriate to the situation, and that the limited availability of expert assessment capacity is considered. Moreover, when developing and applying criteria and processes for evaluation of research and teaching the goal must be to ensure that these management instruments are used to safeguard and increase quality, in particular, but also to promote innovation.

State action in the framework of the basic federal structure of the German system of higher education and research is diverse. This plurality of state action in federalism is a favourable prerequisite for the promotion of competition within the academic system. Competition between the Federal Government and the states to achieve optimum promotion of the academic system must be intensified in the future. Numerous areas of responsibility under the general heading of academic promotion can only be adequately resolved when the Federal Government, the states and the academic community all pull together. That is why coordinating institutions must also play an important role in future in the organisation and formulation of German policy on higher education.

Renewing the unity of research and teaching

Universities as organisational centres of academic activity

The call for the unity of research and teaching has been one of the principle maxims of the German academic tradition since the university reforms of the 19th century. Research must be represented and mediated in the teaching system in order to be effective and teaching demands continual renewal from research in order not to lose its role in guiding action. And frequently new impetus for research emerges from teaching.

Realising the unity of research and teaching is to a greater extent today than ever before a task that must be lived out and shaped by the institutions themselves. Lip service to this unity that does not accept or take seriously this creative task is often of an ideological character. Nowadays, the unity of research and teaching means the integration of

23) H. Gassert: Research Foresight in Germany: The Approach of the Wissenschaftsrat, in: BMBF: Forward Thinking, Proceedings Report, Hamburg 1999, p. 154 ff.

research and teaching in a form appropriate to the respective institution and situation. Concrete solutions for the task of integration must always take into consideration that research and teaching are in reality partly already far removed from one another and that therefore it requires extra organisational measures to maintain their integration or regain it. Measures for renewal of the unity of research and teaching cannot however negate the necessary and relevant distinction between the two based on the division of labour and specialisation. They must rather build on this distinction.[24)]

The institutional location that provides the best potential the timely renewal of the unity of research and teaching is to be found in the universities, which represent the centre of the higher education and research system. They are in principle in a position to perform this specific service of integration. Strengthening the universities is therefore of decisive significance. Organisations such as the Max Planck Society can support them effectively.

In Germany, the unity of research and teaching is predominantly individualised in contrast above all to the situation of the higher education institutions in the US. It is up to the individual university teacher to decide to what extent he or she fulfils that research responsibility. In future higher education systems, individual responsibility will become the institutional responsibility of the field of speciality, the faculty and the university. The task of uniting research and teaching can then be fulfilled by different methods. If the institution bears the responsibility, then the employee can be released to a large extent or totally from the task of teaching, as long as others, through their increased participation in teaching, see to it that the incumbent teaching obligation of the institution is fulfilled. This sort of responsible unity of research and teaching creates flexibility in institutional functions. The universities will be able to compete with non-university facilities whose attraction is above all in their concentration on research tasks. In the case where the new organisational structure of research and teaching at the universities leads in the long-term to fulfilling teaching tasks by excellent higher education teachers who then perform little or no research, these will have to ensure that their teaching is at the level of, and in closest contact with, top-level research.

24) Dagmar Schipanski: *Research and teaching at German universities: present situation and future role*, loco citato, p. 91 ff.

Research faculties and, in individual cases, also research universities that predominantly or exclusively attend to research and the education of the new generation of academics, must also have their place in the future academic system. They belong to a differentiated university landscape to which each individual university makes its own specific contribution.

The universities can achieve this timely renewal of the unity of research and teaching if they also succeed in assuming the function of organisational centres of academic activity, alongside their function as places of exceptional research and teaching. The demand for academic institutions to increase their self-organisational therefore applies to the universities to a special degree. The marked institutional differentiation of the German system of higher education and research is also a result of the universities' frequently not wanting or not being able to fulfil the basic integrational responsibility that accrues to them in the context of the system as a whole due to a lack of organisational ability. As a result, the growth in research and in teaching within the higher education system has frequently taken place outside the universities, leading in turn to an even greater separation between research and teaching than is objectively justified.

Achieving universities that can also assume the role of organisational centres for academic activities will necessitate that the universities comprehend internally a part of the institutional differentiation that has been attained outside their walls. They must network their structures to non-university structures, including large-scale research organisations. They must also be in a position to co-ordinate their different activities in research and teaching with one another and to integrate with each other, and in this way realise an ever-changing, form of the unity of research and teaching that will be in step with the times.

The contribution of the private sector

State-funded institutions of higher education have traditionally dominated the German system of higher education. The overall management role of the state as financier of the higher education institutions is an important guarantee for the high quality, by international comparison, of the educational opportunities German higher education offers and to a great measure ensures equal-opportunity access to higher education studies. In the last decade the higher education institutions have opened up to more sections of the population. This has contributed to making reserves of talent accessible that, though increasingly needed in the

course of economic development, went untapped in the past. Not least on economic grounds, it is still necessary to keep the higher education institutions open to students who are entitled to admission and whose education in the schools has given them the wherewithal to cope with the demands of university study. Open higher education institutions are still, as they were in the past, an important basis for social and political stability. Social status and mobility are essentially determined in modern societies by the access to educational opportunities. It is also therefore one of the fundamental elements of future higher education policy that access to higher education studies should remain open and orientated exclusively to talent and performance. This demand does not, however, mean that the higher education institutions should be open to everyone at all times without testing a candidate's specific aptitude for the subject field in question.

Just recently the *Wissenschaftsrat* spoke out in favour of making acceptance onto a masters programme conditional upon the fulfilment of particular qualifications as the higher education institutions introduce tiered courses of study.

Higher education institutions supported by private sponsorship and funding had played practically no role in the German higher education system up until quite recently. In recent years, establishment of this type of new higher education institution or preparation for the same has increasingly been observed. Private higher education institutions cannot replace the offerings of the higher education institutions under state sponsorship and funding. They have, however, in individual cases the prospect of significantly expanding what the state has to offer and/or of providing innovative impulses. They can also have an invigorating effect on educational opportunities, especially practice-oriented training. Above and beyond that, the impetus towards the development of modern, higher education management appropriate to the times can often come from the private higher education sector.

The significance of private higher education institutions and private academic educational opportunities will increase in future. Contributing to this in addition to the increased involvement from foreign providers of higher education in the German market is, not least, the implementation of modern information and communication technologies. It will be the responsibility of the state in the coming years to regulate the emerging market of private educational opportunities in such a way that the variety of opportunities is increased, access is safeguarded and, at the same

time, transparent quality standards are developed. It makes sense for the state to buy capacity at private higher education institutions in particular where little or no opportunity is available at the state funded higher education institutions. There is also the question of the co-operation of state and private higher education institutions as a form of public-private partnership. In principle, however, it should be ensured that private higher education institutions are privately funded.

The increase in opportunities from the private sector in the sphere of higher education studies and the broadening of the field of competition for German higher education institutions that goes along with the increase in modern information and communication technologies makes it necessary, in the view of the *Wissenschaftsrat*, for higher education institutions under state sponsorship and funding to be given the option of generating income[25)] from the courses of studies that they offer. State higher education institutions should have the right to charge appropriate fees for the continuing education courses they have on offer because such educational opportunities normally promote specific economic goals. This income should remain with the higher education institutions and also be used to benefit subject areas in which there is no demand for continuing education. The right of academics to work a second job should be reformed so that an appropriate balance is achieved between the possibility of their earning an income and the interests of their institutions.

25) The issue of the introduction or prohibition of tuition fees is not only current, but also of major significance for the future of the higher education system. In recent years there have been repeated controversial discussions about this. The *Wissenschaftsrat* has already addressed this in connection with drawing up its *Zehn Thesen zur Hochschulpolitik* (1993) even though it did not find its way into the theses. Just recently there has been a relaxation of the rigid confrontation of proponents and opponents—the Standing Conference of Ministers of Education and Cultural Affairs and the Conference of State Prime Ministers have dealt with this topic and individual states have begun charging registration fees or fees for long-term students. Because the relevant arguments are familiar and the issue of tuition fees is at the centre of party politics, partially ideological controversies, the *Wissenschaftsrat* has refrained from dealing with the subject again.

Increasing resources

The Federal Government and the states have undertaken significant financial efforts towards the expansion of the German system of higher education and research in the last few decades. An efficient infrastructure has been created as a result. This infrastructure needs, however, continual renewal and, above all, further expansion. This expansion must include investment in personnel, construction and equipment.

It is now generally acknowledged that success in research and education is not one condition among many others, but rather the decisive prerequisite for future economic development. In other countries, in competition with Germany, this recognition has already meant that, after a period of relative stagnation, the higher education spending has increased significantly. The higher education and research systems of some of the newly industrialised countries, which were just recently barely competitive, have developed rapidly, not least thanks to the disproportionately high level of funding which the governments of these countries have invested in promoting academic activities.

In the light of the above, the *Wissenschaftsrat* considers it necessary for the Federal Government and the states make conspicuously greater financial efforts towards the promotion of academic activities. What is needed is for for science and research taken as a whole to be vested with a new status when it comes to distribution of the budgetary funds at the expense of other areas. Steps in this direction have been observed quite recently, some in the budget development of the DFG and the Max Planck Society and with regard to the increased funding for the higher education construction programme. But a thoroughgoing change in the overall financial situation of the academic community has not yet been achieved. In particular, the long-standing under-funding for the higher education institutions, which the *Wissenschaftsrat* has often criticised, must be resolved and a new phase begun of strengthening higher education institutions as the heart of the academic system. Any strengthening efforts must give special consideration to the recognisably poorer support system for students in place at German universities when compared to international practices, which will eventually stand in the way of structural improvement in the long-term. It is clear that achieving a marked increase in financial efforts in a situation of straitened public budgets aimed at a reduction of the national debt will be more difficult than in the expansive phase of the higher education and research system at the end of the 1950s. It would, however, be a

grave mistake if better exploitation of the available potential within the higher education and research system, which is being argued for here, were to be used as a basis for financial restraint. Better exploitation of the available potential and a sustained, cumulative financial foundation for the higher education system are tasks that can and must be solved simultaneously. Along with this, it must be borne in mind that investment in the academic sphere is frequently only becomes effective after a long preliminary period and that, despite its financial efforts, Germany at present is rather a midfield player internationally. There is no clearly determinable formula for the investment that a country needs to make in its higher education system. It is obvious, however, that this share of the gross domestic product, which has seen continuous growth since the late 19th century, can only be identified by direct comparison with economic competitors. The percentage of GDP spent on research and development amounted to 2.3 % in Germany in 1998. The percentage in other countries is generally well above that, for example, in Sweden (3.8 %; 1997), in Finland (2.9 %), Japan (2.9 %; 1997), Korea (2.9 %; 1997) or the USA (2.8 %). If Germany does not want to fall behind in relation to countries with comparable economic power and innovative capacity and if it wants to create the necessary conditions for promising, but necessarily cost-intensive, future technologies, then Germany needs to make a significantly higher investment in science and research!