

# **FUTURE TASKS FOR EDUCATION AND RESEARCH POLICY IN THE FEDERAL REPUBLIC OF GERMANY**

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## 1. Ladies and Gentlemen,

First, let me thank you for the kind invitation to address you today in my capacity as chairman of the German/Argentine Commission for Scientific and Technical Cooperation. Eighteen months have passed since my last visit to Argentina. I am happy to be here again in this large and beautiful country. In 1994, we celebrated the 25th anniversary of German-Argentine cooperation on research and technology. At that time, the German Research Minister came to Buenos Aires in order to inaugurate -together with the President of Argentina- a seminar on technology transfer.

In the meantime, several important changes in education and research policy have taken place in Germany following the elections in the fall 1994. The new legislative period began with the merger of education, science, research and technology by amalgamating two separate ministries to form one -known in the abbreviation as BMBF. German journalists call it "Ministry for the Future". This term characterizes the growing awareness of the German public that education, science, research and technology are considered as a whole as regards Germany's future as a site attractive to industry and as a prerequisite for competitiveness and prosperity in the 21st century.

The merger of the two federal ministries has now been completed. The BMBF has approximately 1,200 staff members. This number is to be reduced by dispensing 200 posts. Two of the formerly nine directorates-general have been deleted. Besides the Directorate - General, which deals with administrative issues, we now have a Directorate - General for Strategies and International Cooperation and five specialized directorates - general: one for vocational training, one

for higher education and three which deal with financing high-tech: energy and the environment, biosciences and information technology, aerospace and transportation.

The new Federal Minister is Dr. Jürgen Rüttgers, a 44-year-old legal expert from Cologne with experience in the Christian Democratic Union as party whip in the Parliament. Having completed the reorganization, Dr. Rüttgers is engaged in establishing new priorities for the work of the ministry. At the moment in the education policy, several urgent tasks await solution. Complex interdisciplinary interaction constitutes a prerequisite for the future of an industrialized country. It is vital that basic research results be adopted and rapidly applied in the development of technologies and innovative products which are capable of commercial success. To this end, a broad range of well trained, highly qualified personnel is required. This means that the foundations of education training must be laid early to master the technologies of the future. More than ever before, the requirements will be flexibility and adaptability on the part of human resources. The challenges of a coalescing world in the 21st century cannot be met by applying the receipt of the 19th century. This applies also to the campaign against unemployment, which is currently of about 9% in Germany.

2. The new federal ministry supports higher and vocational education with 4.5 billion Deutschmarks. It finances scientific projects<sup>02</sup> within research programmes drawn up from political aspects with the same amount in the following four sectors:

- knowledge oriented basic research,
- long-term programmes needing -for cost- and risk-related reasons government support,
- government provision for the future of mankind, for example the protection of natural resources and the environment,
- key technologies designed to enhance the competitiveness of industry.

Then there is the basic funding of numerous research institutions. This has to be coordinated with the Lander Governments pursuant to agreements including funding formulae. Basic funding is provided for the Max Planck Society, the Fraunhofer Society and the German Research Association DFG, for the 16 national research centres and other institutions of supraregional importance. To this end, the BMBF

provides annual funds of approximately 5 billion Deutschmarks, and, in addition, 1.5 billion Deutschmarks for international research cooperation, for example for the European Space Agency in Paris or for CERN in Geneva.

In 1995 the BMBF disposes over a budget of 15.5 billion Deutschmarks. This represents the biggest share of the funds provided by the Federal Government. The total expenditure of all Lander Governments amounts to not quite the funding provided by the BMBF. Altogether, public expenditure in this field amounts to 32 billion Deutschmarks. However, it clearly lays behind industry's own expenditure on research, which amounts almost to 50 billion Deutschmarks, that is, approximately 60 % of the overall expenditure in Germany.

Together, these 82 billion Deutschmarks spent on education and research amount to 2.5 % of the German gross national product. This amount does not, however, reach the level -neither in absolute figures nor as a percentage- of the comparative figures for Japan and the USA. In recent years, the percentage has even dropped. This is why the situation must be remedied by appropriate measures.

3. We all know that, in many countries raw materials, energy and manpower are cheaper and working hours are longer than in Germany. We know that capital is migrating, that workplaces and modern production centres are established where they can operate most efficiently. Since it will hardly be possible to reduce relevant costs in Germany, we must offer investors production conditions compensating for the high costs. The creation of a climate favourable for investments involves reducing of bureaucracy, for example in connection with licensing procedures. Furthermore it calls for agreement between trade unions and employers. Those in Germany who plan the future must search for ways of securing the high standard of living in the long term. To maintain the position in the fiercer global competition, innovations are necessary.

Such innovations are required in many sectors also in Latin America. They may consist in the development of new products, the improvement of work flows, new techniques or the modernization of social systems. Innovations often require relatively little capital for their success. They are, however, quickly imitated; they guarantee competitive

advantages for only a limited period of time. Legal instruments can provide protection-but much better are new innovations, which reduce the value of former innovations.

So far, the strength of German industry has been the constant improvement of high-quality products, which entailed the work of highly qualified -and highly paid skilled workers. If industry wishes to be successful in the future, new thinking and new lines of action are required.

In Germany, those responsible are engaged in an intensive debate on issue like those:

How can the efficiency of research be improved, how can the results of knowledge-oriented research be turned into innovative technologies more rapidly, what research sectors appear to be of priority and what changes should be made in the field of education?

4. Although it is a matter for the Lander to support basic research, particularly research carried out at universities, the Federal Government supports this area, too. Out of the funds provided, by the BMBF, 40 % is spent on basic research. Since this area continues to be important, the variety and quality of basic research will be further supported via the German Research Association and also by guaranteeing the funding for the Max Planck Society.

It is also important that the -often theoretical- contrast between basic and application-oriented research has to be overcome. The 16 national research centres are to operate on a more application-oriented basis. Innovation orientation and cooperation with industry are to be further developed and enhanced by incentives. Complex sectors of biotechnology, materials research and environmental research call for the interaction of very different disciplines. Research institutions and industrial enterprises should join forces, should agree on perspectives and flagship projects. The topics are to be determined not by government, but by science and industry themselves.

5. The BMBF is endeavouring to contribute towards increasing the volume of research carried out in enterprises. In 1995, industry's research expenditure amounted to approximately 1 billion Deutschmarks less than in 1993. Framework conditions must therefore be improved in such a way that research and development become more worthwhile

from a business proposition. Endeavours to remove obstacles to innovation can be successful if efforts are made to settle the details. It is also important that the innovation capacity of small and medium-sized firms will be strengthened. Over one third of the research funds for industry are carried out at small and medium-sized enterprises. It is important that technology transfer from research institutions to firms be accelerated by means of funding incentives, that firms without research divisions of their own be supported in contracting research and that the exchange programmes for research personnel be intensified.

6. The support of research and technology in the new German Lander continues to have special priority for the work of BMBF. Funds amounting to 3 billion Deutschmarks have been appropriated for 1995 and the same amount is foreseen for 1996. A great deal has been achieved since German unification and the dissolution of the Academy of the Sciences in the former GDR. In particular the creation of western structures at universities and non-university research institutions in the new Lander has been successful. Over 100 research institutions have been established in the new Lander with the help of the BMBF. These institutions are already operating with growing success and enjoy international recognition.

Industrial research however, continue to be a matter for concern. For some time to come, support measures will continue to be necessary, particularly for small and medium-sized firms. It is particularly difficult to correct the consequences of the communist planned, state-controlled economy in this sector. The same often applies to the way of thinking and going about things for the East German people. The fact is, the Germans had to live under two completely different systems for too long. The process of growing-together between Eastern and Western Germany will take longer than many people have thought, but it will be accomplished.

7. I should further emphasize several new priorities in German research and technology policy for the years ahead:

a) Although we in Germany have attained a high standard in environmental protection, continuing support is required for technologies designed to prevent or control environmental damage. International competitiveness plays a major role in this connection. The importance of production-integrated environmental protection for the future of an industrialized society is still underestimated.

Just as the Rio Summit did, the World Climate Conference in Berlin has again made it clear that energy supply must go hand in hand with the sustained protection of our environment, of natural prerequisites for living. Accordingly, the BMBF intends to present a new energy research programme giving priority to the reduction of carbon dioxide emissions, to the reduction of energy consumption and to the utilization of solar energy. The new programme will represent our essential contribution to worldwide efforts in this respect.

b) Today, the service sector is the field with the biggest increase in workplaces. Opportunities for growth are offered in particular by the development of the multi-media. However, administrative barriers must still be removed in order to give the go-ahead for information highways. In this connection, the setting-up of a Technology Council initiated by the Federal Chancellor is important. The intention is to conduct a high-level dialogue between representatives from science, industry, trade unions and politicians in order to identify ways keep Germany a site for industry in the future. The Council's task is to gain a comprehensive picture of problematical issues and to elaborate appropriate recommendations. The recommendations are to be implemented on the individual responsibility of the partners. As a staff, the Council has tackled the topic of information society. As an initial measure, the BMBF has decided to develop a high-speed network for research institutions and universities.

c) Biotechnology is gaining important. Above all as regards disease control one has to exploit the opportunities held out by modern biology. For this reason, the BMBF is conducting a national initiative on human genome research. The aim is to make research results more easily comparable and to examine them systematically as to their application possibilities. This includes new methods for early diagnosis of dispositions to serious diseases and elaborating preventive techniques.

8. When broad-based research and new technologies become increasingly crucial to product innovations, the difficult process of implementation requires qualified labour force. The German dual system of vocational training -that is, the interaction of on-the-job training and instruction at vocational schools- is being funded by industry and the Government. Support for the acquisition of enhanced qualifications is also becoming increasingly important for combatting unemployment.

The aim is to enable more rapid reactions to changes in the world of work. This means that training courses must be reorganized or new courses created, for example in the information technologies.

In particular, people are to be offered opportunities for upgrading and further education corresponding to their abilities, adjusting their qualifications to the development of new technologies. The equivalence of vocational education with academic education is to be achieved by the provision of comparable opportunities for advancement. This includes better support for training in the crafts, which, in Germany, enjoys a longstanding tradition and plays a major role in assuring the quality of products.

Under the German Constitution, the Lander Governments are responsible for cultural matters, which include educational issues. However, the Federal Government has important rights of participation. This also applies to universities, which are maintained by the Lander and engage in teaching as well as research.

The situation at German universities is unsatisfactory. Reform measures are urgently required also for funding reasons. Lecture halls, laboratories and university libraries are overcrowded. There are 1.9 million students at universities -only half the sufficient number of study places available. 30 % of students discontinue their studies prematurely. Many study far too long. Special programmes for universities, which have been agreed with the Lander Governments, are designed to improve staff numbers and equipment. Financial support offered to needy students is to be made dependent that the student is making normal progress. In the future, such support is to be provided-in the form of loans.

It is particularly urgent that the international recognition of academic qualifications be improved and that internationally oriented courses be introduced in order to enhance the appeal of studies at German universities to foreign students. In this connection, it is particularly important for foreign students that the Fachhochschulen -which offer shorter, practice-oriented training courses- be upgraded.

9. The BMBF engages in international cooperation also beyond the European framework. Worldwide, international goals are becoming increasingly important. One example is safeguarding the ecosystem Earth. In addition, regional priorities have been established. Germany

supports as far as possible the ongoing process of reform in Eastern Europe by providing help for self-help. It assists these countries on the road towards European integration.

The Maastricht Treaty on European Union opens up new opportunities for the establishment of a European education-, research- and technology-based community. The Fourth Framework Programme of the Commission in Brussels, comprising 20 specialized programmes and a funding volume of approximately 25 billion Deutschmarks distributed over four years, was adopted at the end of 1994 under German Presidency. The funds have even been increased, especially as three new Member States have been admitted to the EU. In 1996, negotiations will be conducted concerning a further Agreement designed to strengthen the EU.

Even though European cooperation is becoming ever closer, cooperation with Latin America is gaining importance as a regional focus. The Federal Government therefore recently adopted a Latin America concept. Increased attention to this area is prompted by the fact that the military dictatorships have disappeared from Latin American countries and that economic stability has generally been established in countries where inflation was traditional. Latin America has become politically and economically interesting. In consequence, the BMBF intends to reorientate and intensify its cooperation with Latin America within the framework of the concept elaborated by the Federal Government. The said draft concept will be presented very soon and publicly debated.

The BMBF cooperates with many partners throughout the world in varied areas and in many different ways. The implementation of these activities, whether multilateral or bilateral, is guided by the principles of reciprocity and equality, of the division of tasks and effort and of the benefits which will be enjoyed by all partners. This includes establishing priorities, involving partners in industry and evaluating support results. It should be one of the concerns of scientific cooperation that the government can confine itself to a supportive role. The government should provide stimulus, develop a network of researchers and bring research institutions together. After all, transfer of know-how takes only place in the brains of the scientists themselves.

10. The progressive globalization of world markets constitutes



one of the major challenges for international cooperation. In the past decades, several Asian countries have succeeded in going ahead to take a leading position. If we take a look at the ground they have to make up in order to get this far, it is really an achievement. What took 100 years to be accomplished in Western industrialized nations has been accomplished in Asia in twenty years. This is alarming for the long-established industrialized countries because it shows that, on the market, it is not easy to hold the lead vis-à-vis competitors. New competitors are not required to go through the whole development completed by the established industrialized countries. Armed with the technologies already available, they can enter the arena. They complete a large part of the road by adopting proven structures and technologies. Only on the last part they called upon to be innovative on their own account.

The developments in Asia are encouraging for countries such as the Argentina. I hope to see Argentina develop the framework conditions required for continued development. In this connection, the motivation and performance of scientists are an important factor. The globalization of world markets, international competition and the resulting acceleration of innovation cycles calls for close cooperation of science and industry. The German/Argentine Commission can be a valuable tool in this respect.

11. The globalization of world markets creates problems for a country as a site attractive to industry. In the long term, companies can only be successful at home and abroad if they are competitive. What is needed is an international mix of sites. A prerequisite for this is that companies at home can continue to offer secure workplaces. It is important that a country is attractive to investors also from other countries.

Insofar Germany can record a deficit: last year, German firms invested 24 billion Deutschmarks abroad, while far less - only 5 billion Deutschmarks - in foreign capital flowed into Germany. What must be done in order to ensure that Germany remains interesting to investors? At a time when more countries are joining the ranks of competitors on the world markets, when new products are being developed with new infrastructures, international cooperation gains enhanced importance. As a consequence Germany and Argentina should cooperate more closely to the benefit of both sides. In Latin America there are natural

circumstances which we do not have in Germany. I am, for example, referring to the Antarctic and to the Tropical Rain Forest.

We have already achieved a great deal through our joint efforts.

- Together we have founded the first research institution in the Antarctic to be operated by two countries: The Dallmann Laboratory on King George Island.

- We are jointly supporting projects in the field of photovoltaics and wind energy.

- The cooperation between our space research institutions is exemplary. Space technology is being increasingly used as a means of Earth observation.

Remote sensing activities concern agricultural information, the investigation of interventions in ecological systems.

But we should not hide the fact that the cooperation in the last year did not come up to expectations. In Germany, we know about financial difficulties and respect endeavours to economize. The current stability in the Argentine will benefit industry -and also science. In Germany, too, we are cutting back expenditure. But there are forms of cooperation which are not very costly. I am thinking of exchange programmes for scientists and experts and also of seminars.

12. In future we should cooperate more intensively in sectors which interest our Industries. This cannot be done by means of a unilateral transfer of technology. Cooperation must be in the interests of both sides. Our scientific and technological cooperation started as support for the German and Argentine nuclear industries and, after these aspects had receded into the background, developed into highly diversified cooperation between scientists in widely varying disciplines. In future, we must ensure that an increased number of industrial firms participate and that we combine research and industry on both sides in a 2-plus-2 formula. In this connection, the German/Argentine Commission can play a supportive role.

We should also consider whether we should develop cooperation in the field of education. Up to now there has been virtually no cooperation on education between the BMBF and the Argentine Government, apart from various programmes for the exchange of scientists. There is cooperation with the German Ministry for Economic

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Cooperation, but this establishes its priorities on a different basis. I can imagine, for example, seminars which, while providing vocational training, also offer German entrepreneurs the opportunity to present technologies to an interested public. I can also envisage the further development of exchange programmes.

We are still at the stage of developing new ideas, which we will have to discuss with one another. Planning our scientific and technological cooperation in an innovative manner we can increase benefits for all concerned. The next meeting of the German/Argentine Commission in 1996 will have to tackle these issues.