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Science & Technology

***Europe
Germany: Research Integration Since Unification***

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Germany: Research Integration Since Unification

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I. Aims and Objectives

[Text] As soon as the fall of the Berlin Wall opened up the prospect of German unification, the BMFT began defining its aims in the field of science, research, and technology and devising the ways and means necessary for achieving them in the light of the experience and knowledge that it had acquired in several years of preparation and implementation of the 1987 pan-German agreement on scientific and technical cooperation. It had already started talks with its GDR opposite numbers before the GDR parliamentary elections in March 1990, and intensified them immediately after, in order to reach an understanding as early as possible about what was to be done before the achievement of German unity and what after, and how to go about creating optimum conditions for research and technology in Germany as a whole. In agreement with the freely elected GDR government, the BMFT was thus able to introduce concrete concepts into the negotiations on the Unification Treaty, and these were eventually incorporated into Article 38 of the treaty and its appurtenant texts (minutes entry on Article 38, Appendix II, Chapter XV, and the general provisions, which are applicable to research and technology as well, in particular Articles 11-14, Appendix I Chapter XIX).

Article 38 of the Unification Treaty defines the primary objective as the creation of a pan-German research and development scene maintaining the standard already achieved in the area previously constituting the FRG and keeping what is worth keeping in the area previously constituting the GDR, and the further enhancement of performance in science, research, and technology, which will thus continue to play an important role for both state and society in the unified Germany. The intention is to achieve this goal by creating a common structure and orientation for science, research, and technology in Germany, by defeating the trend that had evolved in the former GDR and which had become warped by a 40-year centralistic, authoritarian command system, and by bringing research and technology in this region into line with basic constitutional order and constitutional reality with particular reference to:

- scientific freedom;
- autonomy of scientists and scientific establishments;
- priority of scientific and industrial initiative over state action;
- federal state system for state action.

In its various paragraphs, Article 38 of the Unification Treaty sets out the procedures and measures for the following three areas:

- reorganization of the public research and development facility system;
- maintenance and enhancement of an efficient research and technology capability in industry, and
- creation of a modern scientific and technological infrastructure in the laender.

The following chronological table of the main events shows how much has been invested in this goal:

- As early as February 1990, the BMFT organized its first information seminar in East Berlin on the FRG research scene;
- Starting in March, the Science Council, in consultation with eastern German scientists, drew up an inventory of the problems arising out of German unification and the potential solutions;
- Scientific exchange across the border between the FRG and the GDR was facilitated and reached a previously unimagined level;
- The BMFT made considerable resources available and provided unorthodox opportunities designed to promote joint projects between the FRG and the GDR;
- The two ministers of research and technology (BMFT and MFT [GDR Minister of Research and Technology]) and their chief assistants met regularly and at increasingly brief intervals;
- A joint management conclave with the MFT was held in May 1990 at the proposal of the BMFT;
- At the beginning of July, the two ministers met ministers of the federal laender and representatives from science and industry from all over Germany to discuss the principles on which the requisite regulations in the Unification Treaty would be based;
- A few days later, the FRG government, the GDR government, and the laender that made up the FRG at that time asked the Science Council for an appraisal of the GDR academies' establishments;
- Another week later, the BMFT and the MFT agreed on the basic outline of the future Article 38, most of which was adopted in the overall negotiations on the Unification Treaty in August 1990.

Thus, on the day that the treaty that brought about German unification was signed, those responsible for research and technology had not only the rules embodied in this treaty, its appendices, and the protocols and approved memoranda to the treaty, but also a clear understanding of the difficult problems arising out of its implementation and a ready-made set of instruments for solving them:

- Procedures for appraising and restructuring the research establishments (primarily Academy of Sciences facilities) in the former GDR and transitional financing to cover their implementation;
- BMFT guidelines and funding (including the remainder of the 1990 MFT budget) for extending well-established FRG methods and programs for funding research and technology in science and industry to the whole of Germany and for meeting the new laender's long-standing need for funding;

- Plans for creating an adequate research and technology infrastructure in the former GDR area and for admitting the new laender to the western German, western European, and worldwide infrastructures;
- Rules for handling existing cooperation agreements between the GDR and, primarily, the East bloc.

This went a long way toward creating the preconditions for the transition from the bilateral relationship between the FRG and the GDR to a domestic pan-German relationship within the BMFT's area of responsibility.

Implementation began even before the day of German unification:

- Until the last day of the GDR's existence, the terms of the 1987 agreement were used to strengthen contacts and cooperation between West and East German scientists and research establishments, with Article 38 of the Unification Treaty in mind;
- The BMFT consulted with the boards of the major independent scientific organizations and research facilities in the FRG about the contributions that they would be able to make to creating a homogeneous German research scene;
- In September 1990, the BMFT appealed to West German industry to spend at least 5 percent of its considerable research and development budget on supporting and strengthening modern, efficient, scientific and technological capabilities in East German industry. The large industrial federations, e.g., the BDI [Federation of German Industry], DIHT [Confederation of German Industry and Commerce], ZDH [Central German Craft Association], ZVEI [Central Electrical Engineering Industry Association], VCI [Chemical Industry Association], VDMA [Federation of German Mechanical Engineering Works], and AIF [Federation of Industrial Research Associations], gave their firm support to this appeal.

On the day of German unification, the BMFT set up its Berlin branch office and at the same time laid the foundations for locating more projects managers in Berlin to bring the BMFT's funding facilities as close as possible to eastern German research.

Immediately afterwards, the BMFT set about increasing public awareness as to aims, opportunities, and solutions in pan-German research and development via its eight-point program.

Immediately after governments had been formed in the newly created eastern German laender, the BMFT met its colleagues there in November 1990 to institute a common approach in line with the federal structure and division of responsibilities.

The steps that the BMFT has taken so far toward achieving the goals of the Unification Treaty and the

achievements to date, together with the prospects for accomplishing future tasks until the pan-German research scene is in place, are described below.

II. Reorganization of Public Research Facilities

According to the basic decision taken in agreement with scientists in both parts of Germany and in execution of the task set out in Article 38 of the Unification Treaty, the new laender and Berlin will be supported in creating efficient, compatible research and development structures. This process includes:

- Science Council appraisal of all the scientific facilities of the three former academies (the Academy of Sciences, the Academy of Agricultural Sciences, and the Building Academy), along with some other nonuniversity research facilities, especially those covering agriculture and health research, by 31 December 1991 at the latest;
- Dismantling of state-funded research and development facilities that are overgrown, mismanaged, or rendered redundant in a united Germany because they duplicate other establishments;
- Rendering appropriate sections of establishments independent in a market economy;
- Preventing the decimation of the research scene and safeguarding extensive capacities worth funding in well-established structures by:
 - * promoting academic research;
 - * introducing the requisite research facilities at the land level;
 - * setting up facilities funded jointly by the federal government and the laender in accordance with Article 91b of the constitution, such as Max Planck institutes, Fraunhofer institutes, major research facilities, and "blue list" establishments.

What Has Been Achieved So Far?

A. Approval of the Science Council

Contrary to all expectations, the Science Council appraisal procedure, which reflects the internationally established principles of peer review, got off to a fast, effective start. Manned by "high powered" scientists from both parts of Germany and from other European countries, the total of nine teams set up for this purpose by the Science Council have already visited some 80 establishments, including all but two of the former Academy of Sciences institutes. After extensive consultations, on 25 January 1991 the Science Council passed recommendations on:

- Central Institutes of Molecular Biology, Cancer Research, and Cardiovascular Research in Berlin-Buch;
- Institute of High-Energy Physics in Zeuthen, Brandenburg, and
- continuation of 30 long-term humanities projects.

Pursuant to Article 38, paragraph 1, of the Unification Treaty, work on conversion is beginning immediately: The BMFT will soon reach an agreement with the land of Berlin on setting up a committee to found the biological and medical research center in Berlin-Buch as recommended by the Science Council, and representatives of the federal government and the laender of Brandenburg and Hamburg are currently meeting to discuss integrating the Institute of High-Energy Physics into DESY [the German Electron Synchrotron].

The Science Council will meet in extraordinary plenary session on 12 and 13 March 1991 for consultations. All in all, recommendations on the majority of Academy of Sciences institutes may be expected by July 1991.

This procedure for appraising and reorganizing an entire research system has no precedent. On the whole, the difficult compromise between careful assessment and the need for speed has so far been successfully struck. The federal government's willingness to share the cost of financing the Academy of Sciences institutes for the duration of the assessment, as established in the Unification Treaty, was an essential condition in this respect.

Criticisms voiced by some of the institutes affected, especially at the beginning of the appraisal process, have since given way to the recognition that, despite the blows to the self-confidence of the scientists assessed that it entails, this procedure is actually helping the institutes under assessment, as it represents the only way to arrive at a rational, practicable decision-making process.

B. Reduction of Staffing Levels at the Academy of Sciences

Before facilities not actually essential for the continuation of research could be dismantled as required, the laender had rapidly to acquire the ability to act vis-a-vis the Academy of Sciences in its capacity as an association of institutes that had been dissolved on unification. At the suggestion and with the support of the BMFT, the new laender founded the Coordination and Liquidation Office for the former Academy of Sciences Institutes (KAI), under the supervision of a joint steering committee, for this purpose.

The BMFT has primarily supported rendering employee units with service functions independent in a market economy. This it has done both directly and by financing professional management consultancy. Thus the Boehlau and Akademie publishing companies have been divested; a foundry has been privatized, and the contracts establishing five more independent technical and scientific firms are ready for signature. Further, the technical and economic viability of 35 other candidates for independent status is currently being assessed with the aid of management consultants.

It is largely through these measures and by rationalizing the service sector that the staff level has so far been reduced from 24,000 to 19,725.

C. Transfer of Research Capacity to the Universities

It emerges from the Science Council's consultations to date that the transfer of productive research groups to universities will be recommended in a large number of cases, as this seems appropriate in view of the basic orientation of their research topics. Redirecting research to the universities will cause considerable problems in view of:

- the very high staff-to-student ratios in the universities in the new laender and
- the general financial problems faced by the new laender.

The federal government and the laender are currently examining the possibility of easing this burden on the new laender under a special joint program (Special University Program III).

D. Research Establishments at the Land Level

The Science Council's recommendations on the founding of research facilities at the land level have yet to be announced. There are indications along these lines, for instance in environmental research, disused waste tip reclamation, and probably agricultural research as well.

E. Joint Research Funding

The legal premise for joint research funding in accordance with Article 91b of the Constitution was created on 1 January 1991, when the new laender became effective parties to the Outline Agreement on Research Funding and the implementing agreements for the DFG [German Research Association], the MPG [Max Planck Society], the "blue list" institutes, and what are known as the implementing projects; each land can accede to the implementing agreement for the Fraunhofer Society (FhG) at any time.

A regulation governing financing has been adopted by the multilaterally funded organizations (DFG, MPG and FhG) to take account of the special situation that will prevail over a transitional period scheduled to last until the end of 1994: The new laender will be liable for the laenders' share of the costs arising solely in the accession area and will not contribute to existing institutes in the old federal laender.

The following outlines are already emerging in some areas covered by the individual research organizations:

- The Fraunhofer Society is planning to create eight independent research facilities and eight more branches of existing Fraunhofer institutes with a total of 850 employees (for an overview see Appendix 2); planning is being carried out in liaison with the Science Council. The institutes are scheduled for founding from 1 January 1992 and will initially have a fixed term.

- The Max Planck Society is pursuing three goals:
 1. to continue promoting direct cooperation between scientists and research facilities in the new laender and Max Planck institutes; the federal and land governments will make an extra 5 million German marks [DM] available for this purpose in 1991;
 2. to set up fixed-term teams, institutionally linked to existing Max Planck Institutes, as soon as possible in universities; there are already concrete plans for 13 teams (for an overview see Appendix 1);
 3. to set up project teams as foundation stones for institutes, or even to found Max Planck institutes immediately; four project teams and one institute proposed by the MPG are currently under discussion, and further proposals may be expected in the light of the Science Council's assessments.
- Two establishments already emerge as suitable candidates for integration into major research facilities at the current stage reached in the Science Council's consultations, in both cases with considerably reduced personnel. These are the Institute of High-Energy Physics in Zeuthen, which might become a division of DESY, and the Institute of Cosmic Research in Berlin, which might become part of the DLR [German Aerospace Research Institute].

It is currently considered that substantial federal government participation will also be necessary for the Biological and Medical Research Center in Berlin-Buch, the potential continuation of the Central Institute of Geophysics in Potsdam, and maybe a new ecology research center, for example in the Halle-Leipzig-Bitterfeld area. In the light of the Science Council's consultations to date and the structure of the research in the laender, it is also to be expected that the foundation of "blue list" facilities will be proposed with staffing levels that will be at least proportional to those in the old laender in this research funding area.

- As in the old federal laender, the academies will also play an important role on the scientific stage of the new laender as learned societies and land-level research and research funding organizations. In addition to the Leopoldina German Academy of Naturalists in Halle—the world's oldest natural science and medical academy—this also applies to the Berlin Academy, which is currently being refounded and which is a direct descendent of the learned society set up by Leibniz in 1700, and the Saxon Academy in Leipzig.

In the months ahead, it will be the BMFT's task to find viable, fundable ways to establish institutes, primarily in talks with the individual laender where the new research facilities will be situated, but also involving the old laender via the Federal-Land Committee on Educational Planning and Research Funding.

III. Fostering Research and Development in Industry

Efficient, market-oriented research and development are necessary for positive economic development and the creation of secure employment in the new laender. The restructuring of the former combines and the businesses they used to own will mean the dismantling of considerable research and development capacities, as overmanning and inefficiency must be done away with. There is however a risk of an extensive disintegration of industrial research and development resources in view of the difficulties that companies are facing.

An enormous task, which will require a joint effort throughout Germany, arises here. Firms must carry out their own market-oriented research and development at their own risk and using their own resources. It will be of decisive importance in the new laender as well for firms to base their research and development on their own competence and market knowledge. The state can support industry here on a secondary level only and contribute to the creation of an innovation-oriented infrastructure.

The restructuring of industrial research and development needed in the new laender will only succeed if, in particular, western German firms across the board become involved as well. For this reason, the Federal Minister of Research and Technology appealed to western German firms at the end of September last year to spend 5 percent of their research and development budgets in the former GDR for market-oriented research with immediate effect. This does not mean that market-oriented research and development are only to be carried out by western German firms. The firms in the new laender must also make whatever contribution they can; similarly, the market must be open to research and development investments from foreign firms.

The 5 percent appeal has been welcomed by the industrial confederations (BDI, DIHT, ZDH, VCI, VDMA, ZVEI and AIF). The former GDR's industrial research and development priorities, which are often similarly weighted, are a good starting point in this respect. The commitment of western German firms is constantly increasing, but there is still potential for it to pick up even greater speed. Among the numerous research and development cooperation projects planned or already agreed, the emphasis currently lies with communications technology, microelectronics, microsystems engineering, information processing, laser engineering, materials research, environmental engineering, and chemistry. All sectors of the mechanical engineering industry are also increasing their commitments via contract research, joint research, etc.

The BMFT is supporting the restructuring and creation of efficient, market-oriented research and development capacities in firms in the new laender, both through the general funding available under technical programs and via a series of measures adopted specially for the new

laender. These measures have been specially devised to help small and medium-sized enterprises overcome their research and development problems.

1. Special Measures for the New Laender

The measures launched specially for the new laender were developed out of the programs that have proved worthwhile in the old federal laender and are designed to help industry in the new laender to acquire and build on innovation potential wherever possible from its own resources and use it for greater competitiveness. They are intended in particular to create an infrastructure conducive to innovation, to support technical developments, whether in-house or contracted out, and [to foster] technology transfer. These measures are as follows (see also under IV "Infrastructure):

- As an incentive to the establishment of as many new technology enterprises as possible, the BMFT is funding the foundation of technology-oriented firms on the basis of its former experimental scheme.
- Funding for training young research workers will make it possible to begin or increase in-house technology development and redistribute research and development staff (e.g. from the Academy of Sciences institutes into industry).
- Subsidies for "contract research and development" will encourage small and medium-sized enterprises to place research contracts with research and development establishments. At the same time, this program will also foster stronger market-orientation in the research and development facilities in the new laender.

2. General Supplementary Project Funding Measures

In order to improve opportunities for access to technical programs for firms in the new laender, the BMFT is granting them a 10 percentage point bonus over the standard subsidy level when funding projects. This means that where the standard subsidy level is 50 percent, a firm has to find 20 percent [as published] less out of its own resources (from 50 to 40 percent). Furthermore, simpler regulations have been introduced to accelerate, simplify, and facilitate approvals, although they are initially scheduled to expire on 31 March 1991 pursuant to an agreement with the BMF [Federal Finance Ministry] and the BRH [Federal Audit Office]. However, the BMFT is taking steps to extend these regulations.

3. Further Matters Under Consideration at the BMFT

- To complement the "contract research" program directed toward applicants from the new laender, additional incentives are planned to encourage western German enterprises to award research and development contracts to institutes in the new

laender, so as to maintain the demand for research and development services there and increase East-West cooperation research and development.

- The ministry is also examining whether measures for the widespread introduction of key technologies in small and medium-sized enterprises in the new laender ("catching up strategy") can be drawn up and financed, e.g., for introducing modern manufacturing technology (CIM [computer-integrated manufacturing]) and applying microelectronics (e.g. ASIC's [application-specific integrated circuits]). However, measures of this kind still need in-depth analyses of the situations prevailing in individual technical fields in the new laender.

Moreover, the BMWi [Federal Ministry of the Economy] is still preparing general innovation funding measures for the new laender: personnel cost subsidies, in-house innovation funding, and fostering joint research. In addition, research and development investments are also being subsidized as part of the general funding for investments in the new laender (the federal "regional economic structure" project, investment grants, and the forthcoming special investment depreciation allowance).

IV. Enhancement of the Research and Innovation Infrastructure

Firms and research establishments in the laender need state-of-the-art technology quickly if they are to survive competition on the market and in science. The federal government is supporting the modernization process with a series of measures—from assistance with equipment procurement to training schemes and demonstration and pilot projects.

In addition to aid given by the BMBW [Federal Ministry of Education and Science] under the university funding program, the following measures adopted by the BMFT deserve special mention:

Pan-German Research Network

The universities and scientific establishments in the former GDR used to suffer from extensive isolation from the West. They had no links with Western computing centers and data bases. The desire to link these research establishments quickly to the German Research Network was thus all the greater after the political upheavals in fall 1989. The BMFT acted quickly in this respect.

As early as April 1990, the cornerstone of the Pan-German Research Network was laid on the foundation formed by the German Research Network (DFN). The BMFT provided the DFN Association with the resources needed to set up a research communications pool with the Academy of Sciences' Institute of Computer Science and Computing Technology (IIR) and the Technical University of Dresden. This opened up access to Western data bases, made worldwide communications

with Western project partners possible via electronic mail, and allowed use of external computing capacities.

With the assistance of the BMFT, the DFN Association has further improved research data communications in the new laender. Altogether, the state provided about DM13 million for this purpose in 1990.

Almost all scientific establishments in the new laender have since joined the DFN Association and make active use of their membership. Further technical improvements are planned for the current year.

Innovation Consultancy Pilot Scheme

The BMFT grants subsidies for staff and material costs incurred by innovations consultants in eight chambers of industry and commerce (IHK's) in the new laender. Further, training for and provision of information to innovation consultants in all IHK's (15 at the moment) in the new laender are being funded. Small and medium-sized enterprises will thus be able to obtain competent advice on new fields of technology.

CIM Technology Transfer Centers

A company's manufacturing process as a whole can be optimized by creating data links between various departments to form a computer-integrated manufacturing (CIM) [environment]. Given the changing structures and organizational forms of enterprises in the new laender, the opportunities provided by computer integration should be exploited from the outset. The BMFT is therefore funding the establishment and expansion of CIM technology transfer [TT] centers at the universities of Chemnitz, Dresden, and Magdeburg, and at Wismar College of Technology. Approximately DM12 million have been budgeted for this purpose through 1993. The information supplied by the CIM TT centers is primarily of relevance for small and medium-sized enterprises.

Of course, the 16 CIM technology transfer centers that the BMFT has funded in the old federal laender also place their know-how at the disposal of enterprises in the new laender. The CIM TT center at the Technical University in Berlin, for instance, advised some 200 interested parties from the new laender in 1990.

Plastics Technology Demonstration Centers

In order to help small and medium-sized enterprises in the new laender quickly and effectively to acquire knowledge of the modern technical, economic, and ecological aspects of plastics technology, the BMFT and the Bavarian state government are jointly funding the establishment of two demonstration and further education centers for plastics technology in Dresden and Halle. The BMFT has budgeted DM8 million for this purpose in 1991.

Technology and Entrepreneur Centers

The BMFT's pilot scheme supporting 15 technology and entrepreneur centers has met with great interest in the new laender. Costs are estimated at DM15 million in 1991. These centers, which have modern communications systems and infrastructures, will primarily assist entrepreneurs who want to set up an independent business based on new technologies, e.g., information technology, biotechnology, or manufacturing engineering. In addition to this pilot scheme, funding is also available for new technology-oriented enterprises under a special "technology-oriented enterprise foundation" program.

In the meantime, many more parties have expressed an interest in the establishment of technology and entrepreneur centers. The new laender should therefore adopt the concept embodied in the pilot scheme and fund such centers out of their own resources, in order to trigger a wave of enterprise foundations sufficient to meet demand.

V. Technical Program Uptake Levels

Until 1989, research funding in the former GDR was preplanned in detail by the state. The system of project funding well established in all industrialized Western countries was therefore largely unknown in that area.

A major campaign was and is therefore necessary to publicize the opportunities offered by project funding and to encourage researchers to apply for it. The BMFT did this via information handouts ("Research and Technology Guides"), publications, lectures, contacts with dissemination agencies (IHK's, technology centers), by opening a local branch office, setting up and training project management teams, etc. The extra 10 percent on funding and simplified approval conditions for firms from the accession area also fall under this heading.

The aim is to help good teams effectively—which at the moment primarily means quickly—to acquire expertise in new technologies. To enable them to help quickly and flexibly, the new federal laender were given three simultaneous access routes to the technical programs:

- Administrative help: BMFT assistance to the former GDR's MFT in approving applications (before 3 October 1990).

At very short notice and sidestepping bureaucratic channels, the BMFT's technical experts provided the former MFT with administrative help and consultation on some 650 projects in mid-1990. In addition, the BMFT took over about 80 other projects from the MFT after unification, which it processed and approved with funds from the old MFT budget. Altogether 732 projects with a total budget of DM205 million were approved in this way in 1990.

- "Piggyback" projects: BMFT approval granted to western German recipients for joint projects with eastern German institutes and firms. This was also the main system in use before unification, i.e., until 3 October 1990.

This procedure still remains in use: Some of the researchers or teams in the former GDR whose institutional future has not yet been finalized are involved in projects carried out by western institutes, so that they do not lose touch with progress in research. A total of DM80.5 million was approved for these "piggyback" projects in 1990; the figure so far for 1991 is DM50 million.

- Direct funding (BMFT grants to recipients in the accession area):

This only became possible after unification. 486 grants (for a total of DM90 million for the year 1991 alone) were approved for recipients in the accession area in 1990.

1. Work Under the Individual Technical Programs

Recipients from the new laender are of course now included in all funding programs. However, particularly promising developments can be identified in some fields, which are summarized below:

Materials Research

Priority was given to funding joint projects between partners in western and eastern Germany at an early stage in materials research. Five employees from what was then the GDR were already on the BMFT project management staff in mid-1990 in preparation for this joint work, and two plastics technology demonstration centers were opened in Dresden and Halle.

At the beginning of 1991, 40 joint projects were started up, and it is a good sign that industrial enterprises from the new laender are contributing a total of DM5.6 million to them out of their own funds (out of corporate funds totaling DM14.1 million). In the meantime, more consortia have been formed, whose applications are currently pending. The convergence of the research scenes in this area can thus be supported effectively through joint projects.

Information Technology

The structures (combines, research establishments) that had grown up in the information technology field in the former GDR cannot survive in their present size. Yet the new laender need competitive research capacities that can do the preliminary work for industry, especially smaller firms (that have no research facilities of their own).

In suitable cases, the BMFT is supporting the divestment of competitive research and development capacities from the former combines and large research centers. For example, DM4.5 million have been granted to

upgrade the CMOS [complementary metal-oxide semiconductor] development line in the former Microelectronics Center in Dresden (now ZMD GmbH) to state-of-the-art level. On top of this grant, the Western equipment that the company needed was provided by Philips GmbH. A similar process is under way at Carl Zeiss, in Jena; preparations for further projects are under way.

Biotechnology

In July 1990, scientists in what was then the GDR were called on to prepare project outlines for future biotechnology research, 250 of which were then selected jointly by eastern and western German scientists to apply for funding. As a result, 200 projects were approved by the end of 1990. About 30 percent of all biotechnology projects approved by the BMFT in 1990 were thus awarded to the new laender.

Energy Research

The energy research program has the following main priorities for the new laender: environment-compatible combustion engineering for coal, geothermal energy, energy saving, and the exploitation of renewable energy sources.

This means:

- utilizing and modernizing the geothermal power stations in Macklenburg-Vorpommern to heat buildings;
- demonstrating concrete potential for improvements, e.g., reduction of pollutant emissions from coal-fired power stations;
- demonstrating new solutions to problems, e.g., by developing an energy supply concept for the city of Leipzig, demonstrating a gas-fired heating pump at the Bauhaus in Dessau, and using wind and solar energy to power the Koerkwitz sewage works;
- maintaining and building up significant long-term research capabilities, e.g., involving Academy of Sciences institutes in the development of solar energy cells.

Health Research

The following measures aimed at involving scientists from the new federal laender in the health research program have been launched:

- DM2.8 million were made available for urgently needed research equipment in 1990.
- Researchers and research establishments in the new laender were informed about health research funding at special workshops (e.g., epidemiology) and information events. The first joint projects now pending approval have since grown out of these contacts.
- AIDS research projects under way at the time of the agreement on scientific and technical cooperation are being continued.

- The Science Council has already submitted a recommendation that medical, biological, and clinical research be continued in Berlin-Buch. Talks have started with the land of Berlin about appointing a foundation committee for a research center in Berlin-Buch.

Technology Impact Assessment The BMFT has publicized its technology impact assessment activities through information campaigns in the new laender. Several scientists from eastern Germany are currently being trained in technology impact assessment research methods and topics while working on technology impact assessment projects in western Germany. Preparations are also being made for a personnel exchange with the technology impact assessment projects organized by the Commission of the European Communities.

Here too, the aim is to lay the foundation for productive technology impact assessment research in the new laender with advanced training for highly qualified personnel.

Environmental Research, Environmental Engineering, Climatic Research

Environmental research and engineering have a high priority in the new laender. Environmental problems are particularly pressing there, but motivation to contribute to solving them with indigenous proposals is also satisfactorily high.

First and foremost, the BMFT is currently subsidizing demonstration projects and long-term research consortia:

- Leipzig/Halle/Bitterfeld research consortium on the problems facing intensively industrialized areas;
- elaboration of a model reclamation strategy for the Warnow;
- demonstration projects for reclaiming long-standing polluted areas, cleaning up canals, and sewage disposal.

Furthermore, a set of valuable measurements on environmental damage that had been suppressed in the GDR is being evaluated and continued.

On the basis of recommendations from a high-ranking BMFT consultant who has analyzed the environmental research and development potential available in the new laender, the establishment of an ecology research center, a climatic research center, and a demonstration center for environmental technologies is currently being considered. The research consortia may constitute important nuclei around which projects of this kind can crystallize.

2. Prospects

The BMFT will make every conceivable effort to channel the development of the pan-German research scene in a direction that will give science and research in the new laender the same opportunities as western Germany.

The following topics are considered to be of particular significance for the further development of research in the new laender:

- Energy research, as a contribution to resource-saving innovation processes and avoidance of environmental damage;
- Environmental research, as a contribution to improving or reclaiming the environment and living conditions;
- At the same time, if an upturn is to be achieved in the eastern German economy, exploitation of the opportunities provided by modern technology is particularly important. In addition to research in key technologies, priority funding for manufacturing engineering is also decisive in this respect. A start has been made here with the CIM centers.

In parallel with this, the BMFT will contribute to the further development of technology on a human scale in the world of work, including small and medium-sized enterprises and craft trades, under its "Work and Technology" program.

Last but not least, in the new laender as well, the requisite orientational capacity will have to be acquired in addition to organizational capacity. This is principally a task for the social and economic sciences and the humanities. In the federal system, funding for these disciplines is primarily the responsibility of the laender. However the federal government, jointly with the laender, will play its part in placing the economic and social sciences and humanities in the new laender in a position to produce original, independent research on subjects relevant to several regions and of interest to national science policy. Only then can a pan-German research scene become a reality right across the board.

Appendix 1

Recommendations on Establishing Max Planck Society Project Teams and Working Parties in the New Federal Laender.

Working Party Applications

Biological and Medical Section:

- MPI [Max Planck Institute of Biochemistry (Martinried near Munich): working party on Enzymology of the Peptide Bond] at the Martin Luther University in Halle-Wittenberg;
- MPI of Biophysical Chemistry (Goettingen-Nikolausberg): working party on Molecular and Cellular physiology at the University of Erfurt;
- MPI of Molecular Genetics, Berlin: working party on molecular Regulation of the Replication of $\text{in}18$ Plasmids in *Bacillus Subtilis* at the Friedrich Schiller University, Jena.

Chemical, Physical, and Technical Section:

- MPI of Nuclear Physics, Heidelberg: working party on Theoretical Multiparticle Systems at the University of Rostock;
- Astrophysics Institute at the MPI of Physics and Astrophysics, Garching near Munich: working party on Gravity Theory at the Friedrich Schiller University, Jena;
- MPI of Polymer Research, Mainz: working party Synthesis, Structure, and Properties of Liquid Crystal Systems at the Martin Luther University, Halle-Wittenberg;
- MPI of Quantum Optics, Garching near Munich: working party on Nonclassical radiation, probably at the Humboldt University, Berlin;
- MPI of Radio Astronomy, Bonn: working party on Physics and Chemistry of Interstellar Dust in Star Formation areas at the Friedrich Schiller University, Jena.

Humanities Section:

- MPI of history, Goettingen: working party on The Landed Gentry East of the Elbe as a Sociohistorical Phenomenon at the Brandenburg Land University in Potsdam or the Humboldt University in Berlin;
- MPI of Social Research, Cologne: working party on Transformation Processes in the New Federal Laender: Evolution of a System Representing Social Interests at the Humboldt University in Berlin;

- MPI of Psycholinguistics, Nijmegen: working party on Structural Grammar at the Humboldt University in Berlin;
- MPI of Foreign Public Law and International Law, Heidelberg: working group on "environmental law" at the Martin Luther University in Halle- Wittenberg.

Project Teams and MPI's

The proposals in each section are listed in order of priority.

Biological and Medical Section:

1. MPI of Biochemical and Molecular Plant Physiology in Halle (proposed by the MPI of Breeding Research, Cologne); project team on The Dynamics of Protein Folding in Halle (proposed by the MPI of Biochemistry, Martinsried near Munich);
2. Project team on neuropsychological research—MPI of Human Genetics;
3. Project team on chronobiology—institutional funding for population biology research.

Chemical, Physical and Technical Section: No proposals. Humanities Section: Project team on neuropsychological research—MPI on economic sciences.

Appendix 2

**Planned Fraunhofer Facilities in the New Federal Laender
Planned Staffing Level**

Laender		Fraunhofer [Fh] Facility <i>GDR Institute of Origin</i>	Planned Staffing Level
Berlin	1	Fh facility for real time data processing <i>Academy of Sciences Institute of Computer Science and Computing Technology and Academy of Sciences Central Institute of Cybernetics and Computing Processes, Berlin</i>	100
	2	Fh facility for robot systems engineering <i>Academy of Sciences Institute of Automation, Berlin</i>	35
	3	Fh facility for image processing in production <i>Academy of Sciences Central Institute of Cybernetics and Information Processes, Berlin</i>	35
Brandenburg	4	Fh facility for applied polymer research <i>Academy of Sciences Erich Correns Institute of Polymer Chemistry, Teltow</i>	80
	5	Fh facility for polymer compounds <i>Academy of Sciences Erich Correns Institute of Polymer Chemistry, Teltow</i>	15
	6	Fh facility for biochemical ecotoxicology <i>Central Institute of Food, Academy of Sciences, Potsdam</i>	15

Laender		Fraunhofer [Fh] Facility <i>GDR Institute of Origin</i>	Planned Staffing Level
Saxony	7	Fh facility for circuit and system design automation <i>Academy of Sciences Central Institute of Cybernetics and Information Processes, Dresden</i>	30
	8	Fh facility for process simulation <i>Academy of Sciences Central Institute of Cybernetics and Information Processes, Dresden</i>	130
	9	Fh facility for microelectronic systems <i>Microelectronic Center Dresden GmbH</i>	130
	10	Fh facility for electron beam and plasma technology <i>Manfred von Ardenne Research Institute, Dresden</i>	80
	11	Fh facility for material physics and surface refinement <i>Academy of Sciences Central Institute of Solid-State Physics and Materials Research, Dresden</i>	55
	12	Fh facility for ceramics technologies <i>Academy of Sciences Central Institute of Solid-State Physics and Materials Research Dresden</i>	50
	13	Fh facility for forming technology <i>Research Center for Forming and Plastics Processing Technology, Zwickau; Society for Rationalization, Research and Development in Mechanical Engineering and the Academy of Sciences Mechanics Institute, Chemnitz</i>	85
Saxony-Anhalt	14	Fh facility for factory operation and automation <i>Technical University of Magdeburg and the Research, Development and Rationalization Company, Magdeburg</i>	35
	15	Fh facility for micromechanics <i>Academy of Sciences Central Institute of Solid-State Physics and Electron Microscopy, Halle</i>	15
Turingia	16	Fh facility for applied optics and fine mechanics <i>Friedrich Schiller University and the Academy of Sciences Technical Physics Institute, Jena, together with the Ilmenau College of Technology and the Suhl College of Technology</i>	80

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