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前 言

1996年4月,由中国国家自然科学基金委员会组织的科学技术基金法考察团在访问德国期间,德意志研究联合会前秘书长 Burkhard Mueller 先生提议,鉴于中国国家自然科学基金委员会与德国德意志研究联合会已经联合建立了中德科学研究促进中心,该中心应将科学技术法制研究作为一项重要任务,目前中国正在拟订科学技术基金法,建议召开一次中德科学技术基金立法双边研讨会。Burkhard Mueller 先生的建议很快得到我方的响应和赞同。

为了开好这次中德科学技术基金立法双边研讨会,一年多来,双方就会议目的、组织委员会成员、讨论方式、时间、地点等问题进行了具体磋商,并确定了双方共同感兴趣的八项议题。会议于1997年12月11~16日分两步进行。

11~12日为科学技术基金立法报告会,作为研讨会的预备会。会上,除了中方详细介绍了中国拟订科学技术基金法的有关情况外,德方五位法律和科学技术基金管理专家作了很好的学术报告,报告对我国制定科学技术基金法具有重要的参考价值。

15~16日的研讨会上,中华人民共和国国家科学技术委员会副主任、本次研讨会组委会主任徐冠华教授出席并致辞。十几位中方法律、科学技术基金管理专家和科学技术基金法研究、起草小组成员分别就八个议题发了言,阐述了对这些问题的观点,中德双方专家就科学技术基金立法背景条件、基金的建立、管理、评审、监督、增值以及税收优惠等问题进行了深入研讨。

会议期间,德方专家除有针对性地介绍了德国的现实做法和经验以外,还就中国草拟的科学技术基金法(草案)的某些条款发表了意见。通过这次会议,加强了相互了解,交流了经验,增进了友谊与合作,为推动中国科学技术基金的法制建设起了积极作用。

为了把本次研讨会的成果记录在案,便于双方今后进一步开展科学技术基金法制研究,特将本次会议有关资料汇编成册。

借此机会,谨向与会的双方专家、学者和所有为筹备、组织这次会议的各位表示深切的感谢!

陈 佳 洱

1998年6月

Speech at the Sino-German Workshop on the Legislation of Science and Technology Funds

Xu Guanhua

Chairman, Organizing Commission of this Workshop

Vice Minister, The State Science and Technology Commission, P. R. China

Mr. Chairman,
Distinguished guests,
Ladies and gentlemen,

Through the joint efforts of both China and Germany, the Sino-German workshop on the legislation of Science and Technology Funds has opened as expected. Please allow me, on behalf of the State Science and Technology Commission of People's Republic of China, to extend our warm welcome to all the experts and scholars from China and Germany attending this workshop.

Funding science and technology through the adoption of funding system, in many developed countries, has long been an effective way to develop science and promote technical progress. More than a decade ago, as an important measure of the reform of science and technology management system in China, we introduced the science and technology fund system, which has proved successful. It has played an important role in reforming science and technology funding management, optimizing resource structure, guiding fair competition, and speeding up the training of young scientists. It has been warmly received by scientists and researchers in China.

Today, apart from the National Natural Science Foundation which has the largest resource and widest coverage, there are also many other science and technology foundations set up by different industries, departments and regions according to their respective needs and conditions. With the development of Chinese economy, the Government and the society have given more and more support to science and technology foundations have also emerged. The science and technology foundation system, as an important result of our reform of science and technology management system, has made great contribution to China's science and technology development and international science and technology cooperation. And it will secure the flourishing of science and progress of technology in China.

An important goal of China's economic and social development is to strengthen the legal system and manage the country by law. Therefore, there is still a lot to do for China's legislation, of which science and technology legislation is an important part. In order to standardize and strengthen the management and monitoring of science and technology foundations, safeguarding the legitimate rights of the parties concerned, raising science and technology investment of the whole society according to law, and guiding the development of science and technology foundation by law, we have to formulate corresponding laws, strengthening the research on the legislation of science and technology foundation, bringing the initiatives of people concerned into full play, raising funds from wider sectors of society, establishing different forms of science and technology foundations, managing the foundations according to law, and strengthening the monitoring of different science and technology foundations. These are crucial elements to the development of China's science and technology and the implementation of the national strategy of "revitalizing the nation through science and education"

This workshop serves as part of our endeavor towards that end. I am sure, through the research and discussion of Chinese and German experts, our meeting will achieve important results.

Germany, the home of the Weimar Constitution, is a country with a long tradition in the rule of law. Our German friends present here have both knowledge of legal theory and experience in the management of science and technology foundation. I am sure we will greatly benefit from your help to improve China's development in the research on the legislation of science and technology funds.

Finally, I wish the workshop very success, and all the participants have the enjoyable stay in Beijing.

Thank you.

Remarks at the Lectures on the Legislation of Science and Technology Funds

Zhou Bingkun

Member of the CAS

Vice-President, National Natural Science Foundation of China

Science and Technology Funds
Distinguished German guests,
Ladies and gentlemen,

Good morning!

The Sino-German Workshop on the Legislation of Science and Technology Funds is inaugurated through the joint efforts of both sides.

First of all, I would like, on behalf of the National Natural Science Foundation of China and the Chinese participants here, to extend the warm welcome to the German experts in law of science and technology, and to express the sincere gratitude for them to give lectures on issues related to the legal affairs in science and technology funds. The same welcome and gratitude are also extended to the Chinese experts and friends present here in the name of the NSFC and myself.

In the field of basic research, the national natural science fund of China has been seeking the harmonious combination of free exploring investigation and the national goal, the reasonable allocation of fund and human resources for basic research, the efficiency of the funds running and the encouragement of innovative research.

The Chinese Government has been attaching great importance to the national natural science fund that has achieved noticeable progress during the last 11 years. The draft of the Law of Science and Technology Funds of China provided to the workshop is drawn up by the NSFC and other related agencies under the guidance of the State Science and Technology Commission. It is to guarantee the legitimate rights and interests of contributors, management personnel and grantees of the science and technology funds, and to normalize and strengthen the management and supervision of the funds. The draft has preliminarily concluded and reflected the successful practice of the NSFC and other science funding agencies in China. It has also absorbed some experiences in the formulation of laws of science fund in Germany, USA and other countries. At present, it is open to opinions of related agencies for further improvement, and is ready to undertake some necessary legislative and procedural matters for approval. The drafting work has been receiving the attention and support from the scientific community throughout the country.

We believe that through the joint efforts of the concerned departments and scientists, with the help of the international exchange in the area of science fund legislation, the legislation for the Chinese science funding system will be more successfully finalized. NSFC is willing to strengthen the mutual exchange and cooperation with Germany and other nations in the area of legislation and other aspects, and to make new contributions to the advancement of science and technology of the human being!

Conclusion Remarks at the Sino-German Workshop on the Legislation of Science and Technology Funds

Dr. Ulrich Steinmueller

I wish to express any sincere thanks to all these who have plunged themselves into the organization of the workshop, among whom there are Mr. Glombitza and his colleagues on the side of Germany and I wish also to extend my special thanks to the National Natural Science Foundation of China (NSFC) which has offered my German friends and their counterparts the opportunity to discuss this interesting subject.

We are pleased to have had discussions with so many distinguished Chinese experts in quite a lot of fields in the past two days. As Professor Wolfrum has pointed out, all the participants were able to speak frankly and sincerely in the discussions so that all the discussions could go penetratingly. I hope that the cooperation between us will be based on this workshop in the future.

In the past two days a number of significantly special topics were discussed at our workshop, such as the background and conditions of the legislation of science and technology funds and its management as well as value added tax. Naturally, some other important problems related to the supervision and appraisal of the use of the funds and a series of problems, such as the creation, cancellation and dissolution of science and technology foundations were dealt with in the discussions. Many experts made splendid speeches. I sincerely thank all of you for your endeavor. It is my belief that the workshop would have not been so successful if there had not been your excellent contributions at it.

I personally believe that discussions as mentioned above are not unnecessary. As the background of the laid discussions a number of academic lectures had been delivered before them and the discussions held here were precisely based on the presentation of every lecture. I would like to express my thanks once again to all my colleagues and friends, who have made preparations for the workshop, delivered most interesting speeches and lectures at workshop and participated in the discussions of the workshop. I believe and I think also that this kind of cooperation may be a way of exchange for the Sino-German Research Center for Research Promotion that will be established.

The discussions of the workshop were carried out around some key problems concerning the law of science and technology funds. Judging from the process of the discussions a lot of the statements and descriptions have been gradually accepted, but some of them are needed to be further discussed, which would like to mention and make brief explanation of instead of expecting the whole process of the discussions. All of us have unanimously held that the independence in scientific research is very important, but the problem is how it can be guaranteed and put in practice in the coming days. Besides, there are such problems as control, supervision, selection and the operation of funds. Another problem is who are entitled to be funded by the foundation and how the foundation grants its proposals.

The one is closely linked to the above-mentioned problem—the independence in scientific research. We maintain that peer review is very important as well as how to choose experts for the appraisal of proposals to be granted by science and technology funds, namely, the selection of such experts should be stated more clearly; on what principles and regulations they work; and how they are selected by voting. And the

regulations and rules on the assessment of scientific researches should possibly be specific. As to the interviews and procedure for such assessment further discussions can be made. We think, however, that the work in this regard should be done through more open mechanism, such as the introduction of scientific activities to the society—accomplishing the assessment by publications and other channels, or doing it by a third person in neutrality. The next problem is money.

We hold that the government should shoulder the major responsibility of funding science in a country. In the past two days the grant from various foundations to science was included in our discussions, which is in my view, another important source of fund for science and technology. The efficient work of science foundations are not, however, the excuse that the government could shirk its responsibility of aiding science. To make free use of those in the second place resources of the society the government should re-adjust the law of tax, offering favor in tax to those who have made donations to arouse their interest in donation. The law of tax in China was to in our discussions. As I know, regulations and rules in this respect in the country are positive though I am not an expert in this field. It is demonstrated in our discussions that there exist different hopes for donators and judging by this, it is necessary for us to discuss the wording, drafting and revision of relevant articles of the Law of Science and Technology Funds.

The last point that I would like to deal with is the management of science and technology funds. According to the experience gained in Germany there is, I think, the necessity to distinguish foundations with government fund from those financed by social donation. Perhaps, it may be more ideal to handle the funds of the said two categories of foundations in two chapters through legislation. In short, the simplest way in the management of science and technology funds is by the law of tax. This is feasible according to the experience in Germany. Today some speakers have mentioned unlawful conducts in foundations, but this problem may belong to criminal law and its corresponding laws and should not include in the law of science and technology funds.

I would like to put up a specific question if I were permitted. I do not think that there is any significance to write any percentage or specific data into a text of law. It is better to have them decided in general terms. Now the legislation of the law of Science and Technology Funds has not been accomplished, which has a brilliant future. My German friends and I have the common view, that is, we shall be greatly happy if our tasks and speeches are helpful to the legislation of the Law of Science and Technology Funds of China.

I would like to express once again my heartfelt thanks to all the ladies and gentlemen present here, especially to the extremely cordial and friendly atmosphere in here.

Thank you!

The Analysis on Legislative Background and Environment Conditions on the Law of Science and Technology Funds - Research promotion between autonomy and political guidance -

Prof. Dr. Hans-Heinrich Trute

Even if they should ever have existed the times have gone in which it was reasonable to describe science only in terms of individual autonomy of the scientists and their neutral, uninterested search for scientific truth. Scientific knowledge has become an important factor of economic competitiveness all over the world as well as a crucial factor for a lot of other societal purposes. For various reasons society is highly interested in the accelerated production of new knowledge for specific societal or political goals.

Hence science policy is no longer a policy of promotion of science as an end in itself but often for specific political and societal goals. The traditional German concept of “Kulturstaat”, which for a long time was the leading idea of the law of science, especially the law concerning the universities, was weakened and more and more replaced or at least supplemented by different concepts, by a more active science policy, emphasizing more utilitarian aspects of the promotion of science. The Law of Science, the design of the administration of science as well as the differentiated system of science reflects therefore an essential tension between political guidance and the autonomy of science to create new knowledge.² To mediate between these two conflicting goals is both a complex and difficult task. It finds its expression in the legal status of research organizations and their internal structure, the status of funding organizations as well as in the design of the science system itself which is characterized by institutions and institutional provisions to mediate between political guidance, scientific self government and other societal interests.³

In my presentation I will analyze the design of the Law of Science and Technology funds from a more sociological perspective to give you an impression of the institutional arrangements of the funding agencies. I will examine firstly the mutual dependency between science and politics and the need for cooperation (I). The second step will give us some analytical tools to distinguish types of research and level of policy decisions (II). The third step will give you an overview of the organizational arrangements of different funding organizations including some comparative aspects. I will end with some remarks concerning the function of law of science and technology funds (IV).

I. Science and Politics: Mutual Dependency and the Need for Cooperation

I will describe the German science system and the law of science from a more sociological theoretical perspective which looks at science as a differentiated subsystem of society which operates in accordance with its own criteria, standards and goals to decide what is scientifically promising new and true.⁴ Science policy cannot and should not - in Germany not at least for constitutional reasons (Art 5 Sec. 3 Basic Law) - determine the criteria and standards for looking at communications and activities as being scientific.

¹ For a more general outline of the fundamental change of the system of science over the last decades and its consequences see *Michael Gibbons/Camille Limoges/Helga Novotny/Simon Schwartzman/Peter Scott/Martin Trow*, The new production of knowledge, 1994.

² *Dietmar Braun*, Die politische Steuerung der Wissenschaft. Ein Beitrag zum Kooperativen Staat“, 1997.

³ *Hans-Heinrich Trute*, Die Forschung zwischen grundrechtlicher Freiheit und staatlicher Institutionalisierung, 1994, S. 493 ff

⁴ See from different theoretical perspectives *Rudolf Stichweh*, Differenzierung des Wissenschaftssystems, in: R. Mayntz/B. Rosewitz/U. Schimank/R. Stichweh, Differenzierung und Verselbständigung, 1988, S. 45 ff.; *Hans-Willy Hohn/Uwe Schimank*, Konflikte und Gleichgewichte im Forschungssystem, 1990; *Niklas Luhmann*, Die Wissenschaft der Gesellschaft, 1990; *Trute*, Die Forschung (FN ■).

valuable, true or false. Science is only what scientists treat as such, no matter what politicians think and say. From this perspective the system of science is as far as scientific communications are concerned an autonomous system. Therefore the political system faces a serious problem, when it aims to guide science, especially research, for specific political and societal reasons. How to guide an autonomous system? How to know what is new, interesting and a promising scientific enterprise? How to know which kind of research should be promoted and to what end?

To put it this way gives us some important hints for the design of the relationship between science and politics. Science needs, even if it is looked at as an autonomous system of communication, resources to proceed. Since the amateur tradition of science has gone, scientists have been professionals, who do not only need money to survive but also for conducting science. No doubt, modern science, especially natural science, is a highly expensive endeavor, today often exceeding the national budgets for science and calling for international promotion, particularly for the international cooperation and coordination in funding. Politics and economy thus grant money and science needs it for the sake of its own proceeding to meet the goals, which are to be set up by the political and economic subsystem (or any other societal subsystem, which is able to provide necessary means). Therefore, government influence can neither be excluded as far as funding and the foundation of institutions are concerned, nor as an increasing control according to political, economic or other social criteria is exercised. The need for resources is therefore the Achilles' heel, the weak spot of scientific autonomy. But this dependency on financial and other resources does not necessarily to political guidance in scientific matters. The intensity of political guidance and control depends on more general concepts of the relationship between politics and science. From a comparative perspective the earlier "bottom up" approach, whereby public funding of basic research brought results quasi-automatically suited to technological application, thus leaving strategic decisions in research policy and the selection of criteria almost entirely to the scientific community, is also from a comparative perspective being increasingly superseded or supplemented by utilitarian strategies of priority setting and the implementation of research programs, that is by "top down" strategies.¹ The promotion of science as an end in itself, in Germany related to the influential concept of "Kulturstaat", has by no means been completely replaced. Therefore in most European Countries a mix of different goals and funding arrangements can be observed. But as an overall tendency the promotion of research has become involved in complex procedures of science policy decisions taking into account the objectives of technological development and user interests.

But even in fields, where funding is related close by to technological innovations and user interest, this doesn't necessarily push aside scientific aspects in favor of political or other criteria. Generally speaking political as well as any other societal actors are unable to set up promising research programs and goals without scientific counseling. The research policy, including the promotion of research by government, is dependent on information provided by the scientific community and success of research promotion, of research programs is based upon the acceptance of the policy by the researchers. Basically scientists themselves decide whether a certain program or the orientation towards a relevant field of knowledge is successfully implemented.

A recent OECD report describes this problem as follows: "In a way, the process of selecting science priority is that of the dialectic between the internal logic of scientific knowledge and that of the needs of the economy and society. The two are different in nature, but scientific research is not outside the

¹ cf. *Irvine/Martin/Isard*, Investing in the Future: An International Comparison of Government Funding of Academic and Related Research, p. 207 ff.

economy or society, and the latter need science in order to develop. The task of science policy is to bring together their objectives while respecting their separate logic. Setting of science and technological priorities is essentially a complex political process involving many people and institutions interacting with one another."¹ There is, to put it another way, a mutual dependency between science, the political system and other societal subsystems.²

Therefore political guidance is characterized by an indirect influence. This shapes the design of the political system dealing with the science as well as the science system itself, dealing with the external goals. Government influence has to rely on incentives - on the creation of opportunities for scientists - and has to convince scientists to follow certain priorities. Therefore *the principle of cooperation* characterizes typically the field of research policy. The international design of science policy, the organization of promotion of science as well as research organization reflects this mutual dependency and the need for cooperation. The legal status of funding organizations and their legally framed internal organization is to a certain extent an expression of this particular situation.

II. Different types of research and levels of policy decision

The principle of cooperation, derived from the mutual dependency of politics and science remains an abstract concept, if we can't fill it with institutional arrangements. As mentioned above the funding of science differs according to political goals and fields of research. So it might be useful to distinguish different types of research. A second step will lead us to different levels of science policy decisions, as political goals setting of priorities and goals is distributed on different levels of the political system, including institutions of mediation between scientific and political interest. This will give us the frame for a more thorough analysis of the organization of funding agencies.

1. Different types of research

Given the different nature of the scientific development on the one hand and the expectations of government and other user interests on the other hand, one may distinguish different types of research. They are well known as basic and applied research and technological development. This classification is often criticized for its lack of selectivity and its suggestion of an evolutionary process leading quasi-automatically from the creation of knowledge (basic science) to its application and transformation in technological innovations. Therefore I suggest using a somewhat different classification stressing less the internal and cognitive character of scientific and technological work but more the orientation of the scientists and the dimension of external expectations and influence.

From this point of view *academic-disciplinary research* is oriented towards the professional standards and priorities of the respective scientific community according to the several disciplines representing the divisions of knowledge, the organizations, reviews and scientific societies, belonging to the respective scientific community. Disciplines are social systems based on a common orientation of the actors, certain structures of interaction and communication, norms and other mechanisms of integration. This kind of research is typically linked with the universities or comparable autonomous institutions, for example the Max-Planck-Society in Germany, although they carry out different types of research.³

¹ OECD, Choosing Priorities in Science and Technology (1991), p. 7.

² Hohn/Schimank, (FN ■); Trute, Die Forschung (FN ■), S. 174 ff.; Braun, Die politische Steuerung (FN ■), S. 29 ff.

³ This comes close to what Gibbons et. al call Mode 1 of knowledge production, embedded in the social structures of an academic discipline, see Gibbons et. al, The Production (FN ■), S. 3 ff.

On the other hand, industrial research, mission-oriented and government departmental research institutions are open to external control superseding autonomous scientific criteria. Both, the governmental departmental research and the industrial research are characterized not only as applied science but as well as a mode of production of new knowledge which is quite different from that of the academic disciplinary research. More important is the orientation towards a different user community with own standards and norm that leads to a release from the social environment of academic disciplines.¹ They are marked by external control mechanisms and an orientation towards specific problems regularly resulting from interdisciplinary work.

The same is true for big science finding its place between these types of research and having its own management problems.² It is characterized not only by the size of research, but by the mission-orientation and the integration of different disciplines and technologies. Research types - as described here - mark boundaries between different practices of research. Generally speaking the German science system is internally differentiated along the lines of different types of research organizations. But it is important to note, that the boundaries of the different types of research and subsequently the different types of research organizations are weakened by the development of new types of research practice, characterized by linking together various research teams from different research organizations thus combining different practices of research. Often new knowledge is produced in the context of application.³ The legal framework for this research practice is no longer a particular organization, but often hybrid forms between organization and contracts, which link together temporarily various forms of teams coming from different disciplines and research orientations including specialists from the context of application. The organizational boundaries and the fragmentation of the research system will thus be weakened by this new forms of knowledge production, which will make it in the long run necessary to develop a new legal frame for this kind of research practice and it will affect the funding procedures. However, this tendency to new forms of knowledge production will not suppress the differentiation of research types but supplement the current forms and will lead to more flexible arrangements. As far as Germany is concerned it might lead to an approximation to institutional arrangement of other European countries such as the English or French system.

A differentiation of research types is not just descriptive or of sociological interest but it refers to different institutional arrangements and therefore different constitutional and legal aspects, as we will see later on!

2. The levels of research policy decisions

The setting of priorities, the elaboration of programs and the allocation of resources require manifold decisions of state institutions. The complex procedure of decision-making is distributed to different levels and institutions mediating scientific autonomy and external influences and guaranteeing the independence of research. Three levels of competence for decision making in research policy can typically be distinguished, the political, the intermediary and the research level.

On the *political level* the fundamental political, social, economic and ecological goals and topics of research and technology policy are defined using - for example - the instruments of medium-term planning and of the budget. It has also an organizational responsibility for the other levels and institutions

¹ Peter Lundgreen/Bernd Horn/Wolfgang Krohn/Günter Küppers/Rainer Paslack, Staatliche Forschung in Deutschland 1870-1980, S. 17 ff.; Edgar Grande/Jürgen Hausler, Industrieforschung und Forschungspolitik, S. 347 ff.

² Hohn/Schimank, Konflikte und Gleichgewichte (FN 4), S. 233 ff.; Margit Szllsi-Janze/Helmut Trischler, Grooeforschung in Deutschland, 1990.

³ For a detailed analysis see Michael Gibbons (FN 1).

of research, at least if the institutions are public or quasi-public. For various reasons, not least for the reason of a federal system, the German political level might be looked at as fragmented. The distribution of competencies has favored powerful mechanism of self-regulation of scientific institutions, which resists efforts at centralization. Nevertheless, one actor plays an important role on the federal policy-making level, the Federal Ministry of Research and Technology, which initiates and promotes a lot of program-oriented research.

The second is the intermediary level. It is the level of mediation between political influence and scientific autonomy where the strategic decisions on topics, research institutions and projects are taken. In the member states of the European Union there usually exist intermediary institutions with the task of funding research, in some cases also the support of their own research units.¹ They are organized in a special way to mediate between government control of differing intensity and scientific interests and provide for a comparably strong participation of scientists. The details of its shape depend on the national conditions and there are considerable differences according to the different types of research. The degree of differentiation of the research system may be also an important factor.²

On the *research level* we find the research institutions, the organization of the actual research activities. These institutions are also characterized by the existence of an organized mediation function for the interaction between the research interests of the institutions and the administrative, economic and other external influences.

III. The organization of research promotion

I will now focus on the organization of research promotion. Against the background of the above different levels the following aspects deal especially with the intermediary level. Coming back to our central question concerning the institutional arrangement to mediate between political guidance and scientific autonomy we may have a more detailed look on the organization of funding agencies and their internal structure.

1. Different types of intermediary organization

We may distinguish different kinds of intermediary institutions according to the mission, the orientation and the intensity of government control. The so-called all-round-agencies mainly promote academic disciplinary and related research in all fields, like the German DFG (German Research Association), [the French CNRS (Centre National de la Recherche Scientifique) or the Italian CNR]. They are more or less oriented towards the disciplines and characterized by a high degree of autonomy. The mission oriented agencies,³ for example the English research councils, are responsible for funding, in some countries also for carrying out of strategic or applied research, and especially for the transfer of knowledge to the user communities. A third type are mediating bodies in the field of government research, established for instance in Germany in the sector of departmental research controlled by the federal ministry of agriculture.

As far as government control of these intermediary institutions is concerned, one can distinguish a more

¹ See Dietmar Braun, Politische Steuerungsfähigkeit in intermediären Systemen am Beispiel der Forschungsförderung, Politische Vierteljahresschrift 34 (1993), 249 ff.

² Trute, Comparative Analysis (FN 14), S. 3, 8 ff.

³ Braun, PVS 34 (1993), 254.

hierarchic and a broader form of coordination.¹ The first type is marked by the fact that government institutions make the formal decisions, but the *de facto* influence of the scientific communities or some scientist by way of prerogatives of formulation, better information and competence is still important to some extent. Institutions of hierarchic coordination are e.g. the project management units (Projektträger) in the field of program oriented research in Germany, the Interministerial Commission in Spain and the advisory bodies of government research laboratories.

In cases of broader coordination government control is clearly reduced. Government institutions are neither responsible for the decisions nor do they have an authority of instruction. But they can influence the decisions of the institutions because of their financial dependence or through government appointed members of the boards. The group of institutions of this type is very heterogeneous. Among them I mention the British research councils, the French public scientific and technological institutions and the German Research Association. They depend more or less totally on government funding and there are varying mechanisms of state control, but government representatives have to negotiate if they want to influence the institutions. The different type of government control corresponds considerably to the type of research, the institution are responsible for funding or for carrying out.

How to arrange these different forms of influence?

2. Degree of independence

First of all, the balance between political guidance and autonomy of science depends highly on the degree of independence of the respective research or funding organizations. Generally speaking this independence varies according to the different types of research we mentioned above. One may distinguish three different types of organization: Those with a close relationship between administration and funding organization, those comprising a right to self-regulation within an frame of state influence and those which gain a high degree of autonomy.

a) Organization with a low degree of independence

Funding by the German Ministry of Education, Science, Research and Technology are often programmed and technology oriented. To carry out this kind of research the Ministry needs organizational support by intermediary bodies which in many cases are a part of the big research laboratories but from a functional perspective as well as from the point of Law of Science are part of the administrative hierarchy of the Ministry. It sets up the research programs and determines the goals and procedures have to be given in accordance with the grants. They were financed by the Ministry, which decides about the personal and is at least from the point of view of the law able to instruct the project management unit in a concrete decision procedure. Despite this dependence on the Federal Ministry this type of research promotion involves more or less informal advice procedure that incorporates both science and industry. In the implementation phase we often find a more decentralized decision making process exercised mainly by research institutions and especially by the large of scientific institutes. They are responsible for scientific and administrative advice, the preparation of funding decisions and the evaluation of research. Here we find a considerable influence of scientific advisory bodies irrespective of the *de iure* responsibility of the Ministry. One may say that even the program oriented funding the participation of experts associated with the respective scientific field is absolutely necessary.

b) Organization with a middle range degree of independence

From a comparative point of view most of the research funding agencies in the EU and America gain a middle degree of independence. They are often corporate bodies and they often have the right to self-

¹ On this and for the following *Braun. Gesundheitsforschung und Fördersysteme im internationalen Vergleich*, p.62ff.

regulation but within a frame of overall-control exercised by the government. It restricts the guidance to setting the research and technological goals and leaves the details and the implementation of the goals to the governance structure of the respective funding organization. This kind of organization might be characterized by three functional aspects:

Firstly there is no right of instruction by the politics, nor are there hierarchical forms of control .

Secondly the government, especially the respective Ministry of Research establishes the abstract goals and the tasks of the organizations in most cases after counseling procedure including high-ranking scientists and representatives from the context of application .

And thirdly in most cases the organization decides on the research programs and the projects often with participation of politicians and representatives from other societal systems.

c) Autonomous funding agency

Seldom we find - from comparative perspective - autonomous funding agencies, being highly independent from government influence. One example of a self-governing institution for the promotion of research is the German Research Association (DFG), an intermediary institution with a high degree of autonomy in spite of its almost total dependence on government funding.¹ It was not founded by government but by the universities and other research institutions. Its mission is the promotion of science in all branches. A large part of its resources is spent in the so-called ordinary procedure where the initiative is taken by the individual researcher. A strict peer review procedure guarantees that scientific criteria are decisive. The scientific experts for the review of the proposals are elected by the scientists of the different disciplines for a limited term of office. There are some different funding procedures for bigger projects with more influence of government representatives in the decision-making boards. But organization and decision making procedures guarantee all in all that the scientific merits of the proposals remain the decisive criteria. The DFG owns a high degree of autonomy and as a result of its representation structures and the funding procedure a high degree of responsiveness to scientific developments in the different disciplines.

3. Organization and procedure in funding agencies

The degree of independence is only one aspect of the institutional arrangements, the second and also very important aspect is the internal organizational structure, which is related to and an expression of the degree of independence from governmental as well as scientific influence. If we look at research promotion organizations from the perspective of organization theory the intraorganizational structures are dependent on the task of an organization and the character of its environment. If we apply this to research organizations we may note that every funding of research means has to cope with a high degree of uncertainty about the outcome of funding procedures. No doubt, the success or failure of a research program or project is difficult to predict at the beginning. Moreover, these organizations act in a very heterogeneous and often changing environment and they need a lot of information from those, who are the addresses of the funding procedures. Organizations should decide on the scientific merits of a project but remain dependent on scientific advice of those who are generally the applicants. For scientific success funding agencies have to get the acceptance of the scientific community, which will only be the case if scientific criteria are decisive and the procedure is fair and reasonable. To be successful as funding organization they also have to convince the political actors about the success of spending a lot of money to the scientific community, and they have to be convinced too that the money is spend within the goals

¹ For details about the position, task and organisation of the DFG *Trute*, loc cit,19.

and programs it is given for. This leads to a specific organization of mediation between political and scientific interests. From a comparative perspective the internal structures of funding organizations has therefore a very typical design.

It consists normally of a technical level. On this level the decisions on the scientific merits of a project are to be taken. Therefore it consists of peers elected by the scientists, cooperated by the funding organization or appointed by government. These scientists have to evaluate the research proposals on scientific grounds. They act as the link to the scientific community, as their representatives. Acceptance of the scientific community will be gained in the long run only, if these scientists convince the applicants, which means the scientific community that the first step in the application procedure is a sound and fair scientific review of the proposal, not a review based on political or other societal goals and criterias.

The proposals often were evaluated on the second level, which one might call the programmatically level, on which the decisions on programs and goals are to be taken and financial controls are to be exercised. Also the strategic aspects of research promotion in the specific scientific field have to be taken on this level. Thus the research proposals were evaluated again, considering other than scientific criteria, such as strategic aspects of financing different disciplines, technological aspects and other societal interests. Consequently aside from scientists also representatives of government and representatives of societal interests participate in the decision-making procedure. Here the mediation process takes places between different goals but on the basis of the scientific merits of the proposals. Organs on this level institutionalize a form of mediation between scientific and other aspects in accordance with the general task of the specific funding organization.

Together both levels with different organs including the scientific executive of the funding organization build up a complex structure to balance the different aspects in this field. Against this background we can come back to our assertion that political guidance is an indirect form of influence on the science system, which seldom allows forms of hierarchical determination in concrete cases. It is on the other hand not only a symbolic use of political power. To get money in the future the organization has to take political goals into consideration and convince the politicians that it is useful to finance specific fields of science. To get acceptance and influence on the scientific community the scientific merits of every program and every decision is crucial for the function of such organizations too. The intraorganizational structures are thus the frame for a complex mediation process.

Taking our different types of research into consideration we are now able to see how political guidance might work through the filter of these organizational mediation process. If you want more dominance of scientific criteria the influence of government and other societal interests must be weakend and vice versa. Election of the peers and the heads of the organizations by the scientific community a greater number of scientists in the organs on the programmatic level may increase scientific influence and thus in most cases lead to a more basic oriented science. Promotion in the area of basic research will give more organizational autonomy to the funding agencies and strengthen the influence of representatives of specific scientific disciplines and communities, which assures that their criteria will be prevalent in the process of decision making. Mission oriented research need more guidance and will therefore lead to closer relationship between government and organization, it will include more government representatives, the executives of the organization will be appointed not elected by the scientists. If you want more technological orientations you will have to include the representatives from the context of application. Thus the institutional frame has to distribute the influence of the different interests.