

German National Research Centers under Political Pressure: Interference between Different Levels of Actors

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1 Introduction

The dissolution of a whole political system (socialism) and its integration into another system (capitalism) is a very extreme form of social change and, obviously, a very drastic cause for severe political turbulence. It is often overlooked that these integration processes have caused significant changes not only in East Germany, but also in West German society and its differentiated subsystems. Undoubtedly, the transformation proceeding the fall of the Berlin wall in 1989 has threatened both the stability and the legitimation of the West German research system more than any other event since World War II. For not only has this process opened up many new opportunities for the focal actors, which include the federal government, the federal states and the German research organizations such as the Max Planck Society, the Fraunhofer Society or the National Research Centers¹ – it has also produced social threats. Now we can see that the opportunities these research organizations had to expand in the East went hand in hand with financial cutbacks and the delegitimation of their previous research programs. This is especially true for the National Research Centers.

But there is another reason why the National Research Centers in Germany represent a very instructive case of politically induced trouble. As op-

1 We prefer the term “National Research Centers” rather than “Big Science Centers” because it corresponds more accurately with the official terminology of the centers themselves and the ministry to which they belong. Nevertheless, the historical identity and organizational development of the centers is based on “Big Science” in the field of nuclear energy.

posed to other research organizations, they were “caught” by German unification in a “double trouble” situation. The National Research Centers had been suffering from political trouble since the mid-1970s and were just recovering when the unforeseen event of German unification threw them into a new, turbulent situation. It is ironic that the National Research Centers were just beginning to cope successfully with their existing trouble when they encountered the challenge of German unification requiring additional new coping efforts. This type of coincidental² trouble situation resulting from the convergence of two different sources of trouble makes the National Research Centers an interesting case study of coping with trouble.

From a theoretical point of view, the National Research Centers provide a good example for the interplay and the interdependence of different levels of actors. Analytically, we can distinguish four levels of action: the individual researcher, the project group or institute as a part of a National Research Center, the entire National Research Center and, finally, the Association of National Research Centers. One of our main goals is to answer the question (from a strategic as well as theoretical point of view) of how coping activities on one of these levels cause – sometimes intended, sometimes unintended – effects on other action levels.

By examining national research in Germany from this particular perspective, we hope to gain greater insight into how scientific actors respond to serious and sudden changes in their political environment. Taking for granted that the growing dependence of the scientific subsystem on the political subsystem is an irreversible result of evolution during this century,³ we must systematically question the strategic capacity of science in modern societies. Therefore, I would like to contribute to an institutional perspective on science using multilevel actor constellations as an analytical focus from which to study strategic action problems of science.

Regarding the research methods employed, it is important to note that the case of the National Research Centers in Western Germany represents an ongoing social process which became dynamic in mid-1991. In contrast to many case studies in this book dealing with “histories” which can be considered complete, the events connected with this case can still be observed. We

2 The term “coincidental” means the “convergence of two independent causal series” as Boudon (1986: 175) puts it. Cf. also Schimank (1988).

3 Cf. the introduction by Schimank and Stucke in this volume.

can collect data from the past and the present, and guess how the future will develop.⁴ Therefore, we can only offer limited observations of real coping activities now, but think it is justified, and might even be fruitful, to speculate scientifically about the future coping of national research actors and the side effects it may have.

Such observations will help to answer these questions in the following sections. 2: Why has German Unification not only offered good opportunities but actually caused trouble for the West German research system? 3: Why are the National Research Centers in West Germany much more susceptible to this form of trouble than other types of research organizations? 4: What are – or might be – the coping efforts of the different actors at the different levels within the National Research sector? And what are the (mostly unintended) effects of the interplay between different levels of coping activities?

2 German Unification: Good Opportunities and Increasing Trouble for the West German Research System

It was not obvious that German unification would create a troublesome situation for the well-established West German research system. International observers, in particular, might think that the term “political trouble” more aptly describes the total restructuring of the *East* German science system, which lost its institutional basis and half of its personnel through the unification process.⁵ Nevertheless, it is not just a peevish complaint when Western actors consider their own situation to be troublesome within the framework of German unification. To understand this, we must distinguish between two main stages of the unification process: a *first stage* of basic decision making, which lasted from early spring of 1990 to the date of unification, 3 October 1990 and a *second stage* of implementation – i.e. making unification actually work – which is still going on. Unquestionably, the actors of the West Ger-

4 My empirical data consists of official and unofficial documents, and interviews with the managing directors of some National Research Centers and with officials from the research ministries at the federal and state level. In order to guarantee the anonymity of the experts, I can only name the organizations from which the information originates.

5 For more detail, see the contributions by Mayntz and by Wolf in this volume.

man research system prevailed from a legal point of view in the first stage, having succeeded in upholding their position that nothing should be changed in the West after unification, and that East German science would have to adapt to the established West German structures (cf. Mayntz 1991; Stucke 1992). But they failed to anticipate that this policy aimed at preserving the institutional status quo could *not* avert massive and substantial repercussions in the West German science organizations during the second stage, which led, in turn, to a new and unforeseen troublesome situation for themselves.

In the first stage, in the winter of 1989/1990, some of the science organizations were motivated by special interests, and some were simply guided by organizational indifference to the processes in East Germany. It is not surprising that the market-oriented Fraunhofer Society⁶ was the first German science organization to present a concept for cooperation with East German institutes and to establish joint ventures with East German scientists. Neither is it surprising, however, that the National Research Centers in Germany reacted to the incentives of the Federal Ministry for Research and Technology (*Bundesministerium für Forschung und Technologie*, BMFT) to expand in East Germany. Having gone through a difficult period in which it had to suffer with criticism from many sides,⁷ "Big Science" viewed unification as a unique opportunity to enhance its scientific reputation. Various types of cooperation with East German scientists and institutes were built up, especially by National Research Centers working in the fields of high-energy physics, cancer therapy, biotechnology and informatics. Despite the existence of individual contacts between individual scientists, there was not as much cooperation in the classic fields of Big Science, nuclear energy and space technology. The German Research Foundation (the largest science-promoting agency in Germany) and the Max Planck Society, on the other hand, reacted cautiously to the expectations regarding cooperation with East German science organizations. Both organizations hesitated because of their limited budgets and because they did not have enough information about the scientific and technological quality of the East German institutes.

6 The Fraunhofer Society conducts applied research in cooperation with state organizations and industry. Most of its institutes are self-financing, drawing on their own profits from contract research for firms and for the government.

7 For more details see Section 3 below, and Hohn/ Schimank (1990: 233-297).

This period of cooperation ended in March 1990 when Lothar de Maizière (a Christian Democrat supported by the West German Christian Democratic Union) won the general election in East Germany and an immediate unification of both states dominated the political agenda. In the early spring of 1990, the immediate and direct unification of the two German states became more and more probable. At this time, the BMFT, which finances 90% of the institutional promotion of the centers, stopped the cooperation activities of the National Research Centers in the East, fearing that the expansion of an expensive type of research organization would have repercussions in its own budget. Gradually, the National Research Centers began to see the process of unification in a completely different light. The phase in which changes had seemed to offer good opportunities gave way to one in which defense of the status quo took priority over all else on the political agenda of West German science organizations.

In April and May of 1990 at the latest, the actors of the West German research system had to start preparing for German unification. Two questions became increasingly important: What kind of institutional science structures would be desirable in a united Germany? What legal and administrative procedures would be needed to establish these all-German institutional structures? At this time, all the western science organizations were interested in preventing the emergence of a separate science structure in East Germany after unification. Despite many diverging interests, they converged at a shared first-order goal: the defense of their respective domains. The federal government, the federal states and the science organizations arrived at the consensus that the institutional status quo should be protected. Specifically, this meant that the West German actors agreed to maintain the federal structure in an all-German science system. The decisive question of what consequences the establishment of five new states in a united Germany would have for the future of cooperative federalism within the area of science policy was completely neglected at this time. The federal government, the federal states and the science organizations were content to emphasize federalism and the joint promotion of science as a formal principle.

The formal organizational structure of the all-German science system was a more critical question between the three actor groups, but they finally managed to agree on this, too. In June and July of 1990, the BMFT adopted the position of the West German science organizations completely. The establishment of new GDR structures and the consolidation of the old ones was to

be avoided, and there was to be "only *one* German Research Foundation, *one* Max Planck Society and *one* Fraunhofer Society." The West German actors neglected to consider the substantial consequences of integrating the former GDR institutes and scientists into the existing West German science system, being satisfied once again to proclaim that nothing was to be changed. To implement the transition of the East German science system, the West German Science Council (*Wissenschaftsrat*) was commissioned to evaluate all extra-university institutes in East Germany with regard to their scientific performance (cf. Krull 1992; Simon 1992).⁸ Those which were evaluated positively were to be integrated into the appropriate West German science organizations, while those evaluated negatively were to be completely dissolved.

Hence, the strategy of the major West German actors with regard to the formal negotiations on the unification treaty became clear:

1. The East German Academy of Sciences would only be temporarily maintained.
2. All East German institutes which were evaluated positively would be integrated into the West German science structure.
3. The new East German states would join the West German "Agreement on the Promotion of Science" (*Rahmenvereinbarung Forschungsförderung*) between the federal government and the states.

This interest in preserving the status quo was sanctioned, finally, by Article 38 of the German Unification Treaty (*Einigungsvertrag*), which went into effect on the date of German unification, 3 October 1990 (*Einigungsvertrag* 1990: 902). By the end of 1990, it seemed that a definite winner in the unification process had emerged: the West German science system. It had successfully preserved its institutional structures, while the East German science system, on the other hand, had been completely dissolved.⁹

During 1991, it became increasingly evident that the unification process in science would be more than a mere formal integration of some East German scientists into the well-known West German structure. In mid-1991, the

8 The corresponding extrauniversity science organization in East Germany was the Academy of Sciences with 24,000 employees (cf. Gläser 1992).

9 The mere transfer of institutions from West to East is one typical pattern of German unification in all policy areas (cf. Lehmbruch 1993).

Science Council finished its evaluations and recommendations on East German science, so that new centers, institutes or project groups could be established in the five new states in the East. In that context, three new National Research Centers were founded in former East Germany in 1992: the Geoscientific Research Center Potsdam, the Max Delbrück Center for Molecular Medicine in Berlin-Buch and the Center for Environmental Research Leipzig-Halle. In fact, German unification opened up good opportunities for some East German scientists and institutes that had repercussions within the West German science system.

As early as 1991, however, the federal government was pressed by a growing national debt resulting from German unification. Consequently, the government proclaimed a political principle of "establishing and developing [institutions] in the East before expanding in the West," so that a new, unanticipated trouble situation for the Western science system emerged. Three interrelated dimensions of this trouble can be distinguished: a financial, a social and a programmatic one. The financial dimension is illustrated by the fact that the institutional basis of the extrauniversity sector in Germany after unification increased by about 20%, while the budget of the BMFT increased only about 10% (Meske 1992). This forced the BMFT to "rob the West to pay the East." Now we have a zero-sum game in Germany in which new institutes and groups in East Germany are financed mainly by cutbacks in the West.

The scarcity of public resources has led in the social dimension to increasing competition between institutes in the East and the West, and among the Western science organizations themselves. Every science organization in the West is trying to use its strategic power and reputation to avoid financial losses and, consequently, to keep open its options for realizing its own scientific programs in the future. According to the "Matthew effect," the institutes and research organizations with good reputations are better off in such times of redistribution, while those with image problems – like the National Research Centers, which had been the subject of criticism for 15 years – are at a relative disadvantage.

Social competition calls forth not only competition for scarce resources, but also competition to preserve the established program areas an institute wishes to maintain. Hence we can expect competition between East German and West German institutes struggling to be more successful in certain research areas in the future. Since political actors will undoubtedly try to reduce

redundant capacities in specific program areas, West German institutes will be forced either to face a process of substantial reorientation, or to vanish from the research scene.¹⁰ Therefore, we may expect increasing problems of acceptance and legitimation for the West German research organizations.

All West German science organizations are confronted with varying degrees of these three types of trouble. But the National Research Centers are in a specific dilemma which has to do with their precarious status in the past.

3 National Science Centers under Political Pressure

The National Research Centers were “caught” by German unification during an important stage of programmatic reorientation. This reorientation was necessary after years of debates on the future of Big Science in Germany and strong pressure from the political actors on the centers to orient themselves toward new and challenging areas of science and technology. To understand this extreme political pressure on the thirteen National Research Centers in West Germany, one must know that the two largest ones (*Kernforschungsanlage Jülich* and *Kernforschungszentrum Karlsruhe*) were founded between 1955 and 1960 for the purpose of conducting research in the field of nuclear energy.¹¹ When some of the basic research programs of these centers came to an end, the federal government had a problem: Closing the centers was impossible because of the interests of the federal states in “their” National Research Centers. Moreover, the personnel could not be substituted by a younger team of scientists with the know-how necessary for programmatic reorientation, because most of the positions in National Research Centers are permanent, leaving the management little flexibility regarding personnel mat-

10 The foundation of the Center for Environmental Research Leipzig-Halle, for example, might be seen by several of the western National Research Centers as a direct threat to their own projects in the field of environmental research.

11 It must also be emphasized that these centers were “creations” of the former Federal Ministry for Atomic Energy. This ministry was able to considerably enhance its own political importance in the field of research policy by founding the centers (cf. Stucke 1993: 141-161). 90% of the institutional promotion is provided by the federal government, 10% by the respective federal states in which the centers are located.

ters. Nevertheless, considerable political pressure was brought to bear on the National Research Centers during the seventies. They were urged to look for new application-oriented research programs which would provide an adequate basis for cooperation with other sectors, especially with industry (Hohn/ Schimank 1990: 233-297). This concept of technology transfer failed partly because the centers were not willing, partly because they were not able to fulfill these political expectations. This resulted in a stage of discontent and disappointment among the political actors at the beginning and then, in the 1980s, in a reaction which can be described as reduced expectations (Hohn/ Schimank 1990: 282-297). A political redefinition of Big Science took place; the political actors, especially the BMFT, no longer expected a technology transfer to industry and a strong orientation to application. Instead, they now projected the future of the centers in the area of long-term programs in the fields of health, environment and bioengineering. The National Research Centers supported this conceptual reorientation because it would enable them to conduct more basic research and to plan more reliably in the long term. Within this general political frame, the National Research Centers made their medium- and long-term plans during the 1980s. It is rather ironic that these plans were induced by political pressure from the BMFT and are now experiencing trouble as a result of policy measures from the same ministry.

The specific directive issued by the BMFT to the National Research Centers in the "old" (i.e. western) federal states in 1991 was to reduce their personnel by 12% to 15% by 1994 (BMFT 1991). The BMFT enforced these reductions by freezing the budgets of the National Research Centers until 1994. These budget cuts were accompanied by a catalog of additional political measures such as: an examination of the programmatic priorities of all centers, the elimination of redundancies in the research programs, and the encouragement of more flexibility within the centers by a reduction in institutional promotion, by project funding, and by transforming vacant permanent positions into nonpermanent ones. It is quite obvious that the BMFT saw an opportunity to reduce costs in a research area it considered to be overfinanced in terms of institutional promotion. Why were the National Research Centers one of the main targets of budget cuts? As a group, the thirteen West German National Research Centers receive far more federal funding than any other branch of extrauniversity research. More than three billion DM are spent annually by these research organizations – three times the amount the Max Planck Society receives from government sources. The National Research

Centers receive 90% of their funding from the BMFT; some 30% percent of that ministry's total budget is appropriated to their funding (BMFT 1991).

This trouble does not affect all National Research Centers equally. Represented by the Association of National Research Centers (*Arbeitsgemeinschaft Großforschung*, AGF), the centers themselves demanded individual consideration concerning budget cuts (KFA 090992; DLR 180892). From the beginning, the AGF took the stance that proportional budget cuts for all centers without a careful assessment of their performance would harm the idea of National Research Centers in general (AGF 070593). This argument was then willingly adopted by the BMFT, which finally drew a distinction between three classes of National Research Centers to which different respective budget restrictions would be applied (BMFT 1992). Four centers (three of which had been founded to conduct nuclear energy research) had to face real cut-backs, five (e.g. the *Deutsche Forschungsanstalt für Luft- und Raumfahrt*, DLR, the space science center) would have to do without any growth over the next years, and only four, devoted to life sciences, to the study of the earth, the oceans and the atmosphere, and to cancer research could expect any growth rates at all (e.g. the *Alfred-Wegener-Institut für Polar- und Meeresforschung* and the *Deutsches Krebsforschungszentrum*). By giving the BMFT the opportunity and legitimation for this strategy to "divide and conquer," the National Research Centers – unintentionally – provoked a detailed and substantial evaluation by the BMFT which might cause new trouble or will aggravate the situation for some of the centers.

Under these preconditions, it is quite evident that collective and solidaristic coping reactions of all centers are improbable. But coping will be difficult not only because the individual centers are affected differently by these policy measures. It will also be difficult because "trouble" does not mean the same thing at the different institutional levels of action. In the case of the National Research Centers, we have to distinguish between at least four levels of action, including different types of actors with various basic interests:

- a. the *individual* level, comprising the individual researchers in the institutes concerned. Here, we have to consider about 6,100 scientists (in 1989) in thirteen West German National Research Centers, most of them in permanent positions.
- b. the *group* level, consisting of parts of institutes or of independent project groups. The size and degree of organization of these working units signifi-

- cant enough to be classified as “groups” vary substantially, so that it is difficult to delineate the exact difference between this level and the corporate level (described below) just by looking at an organizational chart.
- c. the *corporate* level, made up of the institutes and the individual National Research Centers, is characterized by formal organization and hierarchical representation to the environment. The heads of the institutes are particularly important at this level, as are the boards of directors and the management representing an entire National Research Center.
 - d. the *association* level, which has one actor, the Association of National Research Centers (*Arbeitsgemeinschaft Großforschung*, AGF). The AGF has an office and a manager in Bonn, and a chairman elected by all of the National Research Centers. It is the explicit aim of the AGF to “represent the collective interests of the members externally” (AGF 1991: 9; translation by the author).

While these levels of Big Science are all, of course, interrelated, each is affected very differently by political trouble. At the individual level, the individual researcher has to deal primarily with a *threat to his career* when his research area is limited and resources are reduced. At the level of institutes and project groups, such trouble is primarily viewed as a *threat to the groups' competitive position* with regard to other institutes and project groups outside the center. Here, the scientific community is the main reference group. This is not the decisive point at the corporate level, because a National Research Center integrates many institutes and many research programs. Rather, management faces the *threat of a loss of integration and reputation* with regard to other relevant actors (universities, industrial firms, ministries, etc). At this level, therefore, the main interest of a director is that the departments of his research center be considered “successful” (AGF 07051993) by the ministry and by industry. Finally, on the association level, the interests of the individual National Research Centers play a less important role; here, the actors are interested in defending the general idea of Big Science. Cutbacks and criticism from the political actors always represent a *threat that the model of Big Science will be questioned* in general.

With regard to these four levels of action, we can already observe different coping strategies which are sometimes complementary and sometimes contradictory to each other. But it must be emphasized that these different ways of coping according to the respective levels of the actors are not only

the result of certain “objective” problem situations demanding different reactions from the actors; they are also caused by the strategic position of the actors, which predetermines specific perceptions and ways of information processing as well as potential means of coping. If we keep this in mind, we can understand why the corporate level predominates during the coping processes. When the political trouble for the National Research Centers began as a result of actions by the BMFT, the individual National Research Center (and its management) was called on stage as the relevant corporate actor. Indeed, the budget cuts were first addressed by the BMFT to the top executives of the centers in May 1991 and it was seen as the task of the managing directors to inform their institutes and researchers.

There is another structural reason why the corporate level played a pivotal role and why it reacted promptly: Since specific formal positions determine action only at the top executive level of the organization, the institutes and researchers expect their management to be the first ones to cope with external trouble. This is also the case with regard to the association level, which is expected to maintain permanent contacts to the political actors. Hence, both the association and the corporate levels represent typical buffering functions, while institutes, groups and researchers make up the “technological core” (Thompson 1967: 19-24) of Big Science. Only later might the heads of institutes and individual researchers react, possibly to what they perceive as the “failure” of their management. When we compare the two buffering levels, we will observe a predominance of the corporate level over the association level. Empirically, the individual centers were the main recipients of information about the political measures; as we will see, arriving at a collective interest representation of all centers is a new step requiring several preconditions.¹²

4 The Interplay between Coping Activities

As the top *management of the centers* were the first to receive information about imminent budget cuts by the BMFT in May of 1991, coping efforts

12 Concerning the improbability of collective coping reactions in general, cf. the concluding chapter by Schimank and Stucke in this volume.

could first be observed at this level. But it is striking that in this early period of trouble the centers made no serious attempt to exercise their influence on the BMFT in order to *prevent* political interference. Considering the severe budget problems of the federal government and their own weak position, which still had to do with the nuclear energy image of Big Science in Germany, the top executives of the centers saw no real chance to avoid budget cuts. The managing directors of the centers, moreover, had no powerful allies: The other science organizations were their competitors for scarce resources, and the federal states with their 10% share of the financing of the centers had no real opportunity to influence the budget policy of the 90% financial backer (DLR 180892). Furthermore the federal states are always in an ambivalent position: On the one hand, they feel obliged to protect "their" centers; on the other, they see the necessity for a reform and even a reduction of the National Research Centers. It is this permanent conflict between science policy as research policy and science policy as regional policy which dominates the position of the federal states. In the case of Big Science, the states argue that a restructuring of this sector seems indeed desirable, but not as a result of an executive budget order by the federal government (WiMi 17071992). They joined the AGF in opposing the financial cutbacks, but their efforts were not very successful.

For that reason, with regard to the inner structure of his center, each managing director only tried to minimize the undesirable consequences for his entire center as a corporate actor. On the one hand, the directors aimed to satisfy the political actors and to foster the integration and research identity of their center by preparing concepts to reduce personnel, to reorient programs and, sometimes, to restructure organization. On the other hand, they informed their institutes and employees early in mid-1991 about the approaching changes in order to prevent inner conflicts and to gain acceptance for internal restructuring. At first, some of the centers considered it advantageous that the BMFT was only interested in achieving a general reduction in spending rather than at gaining substantial control over the implementation process. Surprisingly, however, they then decided that letting themselves each be subjected to the same rate of reduction was unjustifiable. They thus opened "Pandora's box," eliciting a flurry of political control activities from the BMFT. It was the centers themselves that called upon the BMFT to provide a detailed concept for its budget cuts which would take the specific needs and research outputs of the several centers into account. In autumn of 1991, the BMFT

responded to this demand by developing a differentiated concept for the future of Big Science which distinguished between three classes of centers. In this way, as one managing director of a center put it (KFA 090992), the centers themselves supplied the BMFT with the “sharpened knife” for (possible) further cuts in the future which will lead to an unnecessary “exposure” and increasing competition between the centers.

But the unintended effect of the extended political control by the BMFT is not only due to the myopic, particularistic strategy of the individual centers trying to minimize their own losses at the expense of the other centers. This is reinforced by the strategic behavior on the *associative level* as well which demonstrates the peculiar structural position and role of the AGF. The AGF, founded in 1970 as a collective interest representation of the centers toward the political actors, could hardly fulfill this role over the last twenty years. This weakness is mainly due to the particularistic orientation of the various centers. Unlike the Max Planck Society or the Fraunhofer Society, the AGF represents heterogeneous and, moreover, relatively autonomous research centers (with their own budgets). Therefore, we can expect particularistic coping efforts on the part of the centers to predominate rather than laborious attempts to come to a collective solution on the level of the AGF. At the association level, there is no executive authorized to pass binding decisions effective for the lower level of the individual research centers. The chair of the AGF is a member of the top management of one institute (at the moment the Managing Director of the DLR) who is elected for two years by representatives of all National Research Centers. In view of the “divide-and-conquer” concept of the BMFT, we cannot expect the AGF to find a common solution and formulate joint action with regard to these budget measures. What the AGF really did was to complain in general about the policy of the BMFT and to emphasize the value of the Big Science *model* for the future (AGF 11031992); it did not act collectively on behalf of the self-interests of one particular center. The AGF is not designed to fight, but rather to coordinate, as one managing director put it (KFA 090992). Consequently, the AGF supported a differentiated political treatment of the centers on the one hand, but denied the BMFT’s request to take part in the discussion about the programmatic and organizational reorientation of the centers (AGF 07051993) on the other. Since there are, in fact, influential voices calling for the “burial” of the model of Big Science (FAZ 1992), the aim to defend the *raison d’être* of this type

of research organization appears to be an important coping effort on the association level.

The reference point for the *institute or project group* is its competitive position within the scientific community: The group concentrates on acquiring and maintaining the infrastructure and financial resources necessary for continuing innovative work. Its goals are sometimes undermined by the coping activities of the managing directors of the centers. Coping strategies of the National Research Centers (e.g. decisions executed by their top management) signaling to the political actors that the centers would be willing to implement internal reforms in certain program areas in order to survive as a whole definitely meant trouble for certain project groups. It is inevitable that the management of a National Research Center will sometimes be forced to hurt the interests of several of its institutes in order to maintain the strategic capacity of the whole organization.

One coping strategy at the group level was to oppose the internal redistribution of resources if at all possible. The success of such a strategy depends on the relationship between the heads of the individual institutes and the management (Board of Directors) of the center. Since the Chairman of the Board of Directors of a National Research Center is always appointed by the BMFT (a political decision from the top down), the influence of an institute on executive decisions will be probably low. Therefore, the only way the institutes can cope with internal cutbacks is to look for allies outside of the center (such as project groups at universities or other research organizations) or cooperative partners with whom they can share resources and equipment. The situation for the institutes is aggravated by the fact that they cannot receive any project grants from the BMFT (with the argument that this ministry is the main institutional promoter of Big Science) and that they receive only very limited project funds from the German Research Foundation, whose main task is supporting university research. The same holds true for the European community funds, which are relatively scarce in many program areas with respect to the number of applicants. Finally, the institutes are referred to research contracts in industry. Since the research conducted by many of the centers is not oriented closely enough to the research demands of industry, however, this coping strategy is also limited.

At the level of *individual researchers*, who are mainly interested in improving their career options, we found three different coping patterns (GMD 220792). The first one is exit, meaning that the researcher leaves the institute

and goes to another scientific organization or to industry. This option can be used only by very few researchers who are young and flexible enough to be attractive for other research areas. Another individual option is "exit" in the sense that the researchers of a certain institute or project group leave their team and change to another project group or institute within the same National Research Center. This option was used mainly in one National Research Center where the intraorganizational structure was totally changed.¹³ A third individual strategy is an example for "defensive coping," that is, waiting for better times, which means continuing with one's own work and hoping that political priorities will change again in the near future.

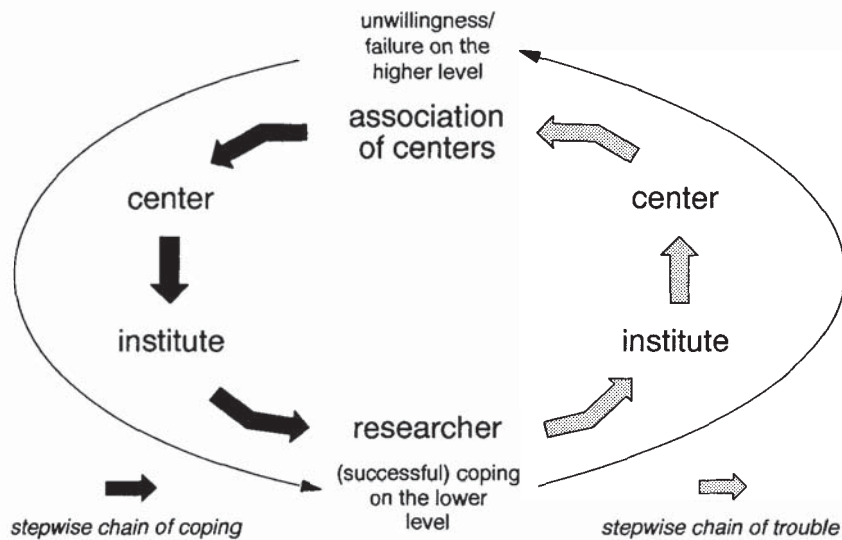
These multilevel coping constellations now become even more complex if we consider the unintended side effects the action on one specific level will have on the other levels of action (possibly causing a new type of trouble). To give two examples of such interdependencies: The exit option at the level of the individual researchers, for example, leads inevitably to a brain drain in an institute or a project group, and in turn affects the respective coping strategies at this respective institutional level negatively. The institutes or project groups therefore lose their micropolitical power vis-à-vis the management of the National Research Center or are no longer attractive cooperation partners for groups outside the center. On the other hand, these side effects may be regarded positively by a particular center because it may support the policy of the top management to reorganize or even close certain constituent institutes.

Another example may serve to illustrate this point. The policy of adaptation on the part of a National Research Center (i.e. willingness of the center's top management to fulfill some of the BMFT's expectations in order to survive as a whole) will inevitably lead to the delegitimation of some research areas, institutes and project groups. In effect, these areas will be "sacrificed" by top management. Obviously, this coping strategy and its side effect, the delegitimation, will have negative consequences for the coping strategies of the institutes or project groups within the center: If they are delegitimated by their own management, it is hardly conceivable that they will still find

13 Under the condition that none of the new institutes will acquire any additional positions for scientists it is rational for them to accept all applications from members of those institutes which are subject to cuts by political measures.

cooperation partners outside the center. Their means of coping are therefore restricted by the coping activities of the higher level.

Figure 1: Interplay Between Coping and Trouble on Different Levels of Action



So far, on the basis of empirical observation, we recognize the first symptoms of trouble, particularly at the individual and at the institute level caused by coping activities at the corporate level. But these symptoms might indicate a general pattern and a specific dynamic of coping and trouble throughout the different levels of action in the future (cf. Figure 1). From a higher to a lower level of action (association, center, institute, researcher), we can observe a stepwise chain of coping which activates the coping efforts at the lower level because of the failure or unwillingness of the next-higher level. Since the AGF fails to represent the collective interests of all members, each center chooses a particularistic coping strategy. But if this corporate coping is not successful or adequate from the point of view of the next-lower level of the institutes or project groups, the actors there have to launch their own coping efforts in order to guarantee the continuation of their research. Finally, if the institute's coping cannot guarantee the career interests of its researchers,

these researchers will react individually to the threat to their professional future.¹⁴

If these different coping reactions at the different levels do, in fact, take place, we have an interesting example for a stepwise chain of trouble in the upward direction. For if there are some successful coping activities at the individual level (e.g. “exit” of the best scientists to other institutes), this will reinforce the trouble at the next-higher level because the institutes lose the very personnel necessary for the success of coping strategies such as arranging for cooperation with prestigious institutes or applying for project grants. But if, however, some institutes are successful – for example in buffering the reorganization plans of the management of the center – this may cause new trouble on the next-higher corporate level because the center management is demonstrating a lack of authority in implementing reforms and thereby satisfying the political actors. Finally, the centers which succeed with their particularistic strategy of minimizing their own losses at the expense of the other centers directly produce a delegitimation of the AGF and, in this way, a new (reactive) trouble which harms the scope of action on the association level.

In conclusion, we see that multilevel constellations play a pivotal role in the institutional perspective on science. Up to now, we often had analyses and theoretical concepts which concentrated on one of these levels. In the future, it might be fruitful to pay more attention to the interdependence of these different levels combined with a dynamic perspective on science, to show how actions and the interference of actions will *cause* structural effects, in turn causing new intentions and actions. In this way, we may also gain more insight into the scope and limits of political action in science.¹⁵

14 That means that there is sequential *logic* of coping actions. This does not exclude coping activities which occur *simultaneously* on the different levels of action, possibly because actors on a lower level anticipate the failure of the next higher level. But often we can assume that lower-level actors expect coping reactions primarily from the higher-level actors, who are thought to have greater organizational capacities to act strategically.

15 As Uwe Schimank and I have attempted to do; cf. the concluding chapter in this volume.

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