

Coping with Trouble as a Complex Constellation of Political and Research Actors: Introducing a Theoretical Perspective

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In this introductory chapter we will offer a theoretical frame of reference for all of the contributions to this book. We will do this in three respects. We will begin by describing the growing practical and – somewhat neglected – theoretical relevance of the topic of “Coping with Trouble.” Then we will clarify the main variables which constitute the topic – trouble and coping – and present an actor-theoretical frame of reference focussing on the aggregate effects of coping within complex constellations of actors. Finally, we will characterize the research approach guiding the organization of this book as a search for a “grounded theory of the middle range,” and provide a preview of the case studies to follow.

Thus, this introduction sets the stage for detailed empirical studies. It does not anticipate their findings – we have saved that “harvest” for the conclusion. This chapter does, however, develop theoretical concepts which we hope will enable the reader to perceive familiar empirical phenomena in a new light.

1 Political and Theoretical Relevance of the Topic

Anticipating the more detailed discussion in the following section, the kinds of trouble we are concerned with here are *violations of certain vital interests of state-financed researchers or research institutes¹ by political action*. Many

1 We exclude industrial research from our consideration, even where it is mainly financed by the state. This is certainly not to deny that industrial researchers are faced with trouble, too.

contemporary examples come to mind quickly. One kind of trouble is certainly the situation which John Ziman has portrayed in reference to the United Kingdom as “science in a ‘steady state’” (Ziman 1987). The money for the promotion of research which had been provided quite generously by the state for more than two decades became increasingly scarce during the 1970s and 1980s in many of the major Western countries. A “period of affluence” turned into a “period of scarcity.” Attempts to establish more rigorous evaluations of the quality of the research promoted institutionally or by project grants were typical of this phase, most visibly in Great Britain. No matter how useful such evaluations may be from the point of view of the state, for the researchers and institutes involved these new conditions of their resource acquisition were obviously often troublesome.

Another frequent source of trouble was political demands to increase the societal utility of scientific research by directing it toward areas of vital concern for important societal groups. Environmental problems, or the development of technologies needed by major domestic industries suddenly had top priority. The trouble implied in this was aptly described under the heading of “science as a commodity” (Gibbons/ Wittrock 1985), which means the danger of research becoming increasingly instrumentalized for the realization of very narrow or even – in the case of military research, for example – dubious societal interests. The dependence of researchers and institutes upon increasingly scarce resources from the state made them increasingly vulnerable to such pressures.

Thirdly, in some fields, research faces trouble or might be facing it soon because of political regulations forbidding specific scientifically promising research themes or methods. The most spectacular recent cases have been in certain subfields of genetic engineering. But the restrictions imposed upon empirical social research by data-protection laws, for example, also hamper research. Again, as with the other types of trouble, there might be – and often are – very understandable societal and political concerns motivating these political interventions. As private citizens wanting to protect, say, their own health or privacy, even the affected researchers themselves might be in favor of such political measures. But for the researchers’ work, they constitute trouble – and it is only this fact that is of concern to us here.

Finally, there is a type of trouble which results from fundamental institutional rearrangements of research institutes or even the research system as a whole. The ongoing transformations of the societies in Eastern Europe serve

as a particularly dramatic illustration of comprehensive change throughout the system. The rapid political, economical, social, and cultural changes occurring in these societies confront their research systems with entirely new demands and expectations. A very special subcase of this is the unification of Germany, because the entire society of the former German Democratic Republic was integrated into the totally different societal structure of the Federal Republic of Germany, with strong repercussions in the research systems of both the East and the West.

For all of these types of trouble – resource scarcity, political instrumentalization, political regulation, and institutional rearrangements – countless stories from the history of scientific research in different countries could be told. Trouble, and coping with trouble, are nothing new. What may be new about the current and, as may be expected, future situation is the cumulation and interrelation of at least the first three kinds of trouble. This estimation becomes plausible within a long-term view of the development of the research system of modern societies.

Since the Renaissance, the differentiation of scientific research as an autonomous societal subsystem has emphasized the character of scientific knowledge as an end in itself. Serving at first mainly as a legitimatory device to ward off interference by the church into the production of scientific knowledge, it later became more useful for defending research autonomy against extrascientific demands from the state, the military, and industry. The greater the researchers' and research institutes' autonomy is, the greater their freedom is to act according to the research system's own inherent logic of action. This logic demands from a scientist that he acquire a scientific reputation by contributing new scientific knowledge which the respective scientific community evaluates as being important and true (Polanyi 1962). Admittedly, not all researchers follow this orientation all the time; but it is, although probably not the dominating orientation within the research system, without doubt the one which ultimately distinguishes research activities from all other kinds of social action. Accordingly, this orientation shapes the vital interests of most researchers and research institutes; it is from the *conflict between this internal logic of action and the research system's dependency on external resources* that the trouble to be discussed here originates.

For centuries, research activities were most often financed privately – either by the researchers themselves, if they could afford it, or by wealthy patrons. As long as the financial demands of research were small, these ar-

rangements worked. In the nineteenth century, however, they began to be replaced by the functional combination of research with higher education at the universities. In this combination, the resource demands of research remain inconspicuous and profit to this day from the high societal legitimacy of teaching. Research at universities shares a common pool of resources with teaching, which is considered legitimate because the teaching is supposed to be based very directly on the results of the continually progressing research in the respective disciplines. But, since the mid-nineteenth century, research has gradually grown beyond the sheltering embrace of higher education. Outside of the universities, research institutes were founded which had to justify their resource demands in other ways. At the same time, the resources required by university research grew to such an extent – particularly in the experimental sciences – that they could no longer be acquired under the cover of teaching needs. Thus, the mobilization of the necessary financial resources became one of the major problems of state-financed scientific research – and, thereby, one source of trouble to the respective researchers and research institutes.

The best way to legitimize one's resource demands has always been to promise that important societal benefits will emerge from one's research. But such promises are inherently ambivalent. They are undoubtedly persuasive, fostering within society certain expectations about future benefits. Sooner or later, however, such expectations have to be satisfied, at least to a certain extent. If they are, they may even grow; then, still more will be expected from an increasing range of research fields. Thus, by solving short-term problems of legitimizing resource demands, the long-term problem of insatiable societal demands for useful research is created. This is precisely what has happened during this century. Since the 1950s, at the latest, Western societies have been portrayed as science-based societies which owe their continual progress to an extensive scientification of an ever-wider spectrum of societal problem solving – from industrial production, political decision making, and health care to such realms of social life as child-rearing or sexuality.² This is the logical conclusion drawn from the cultural tradition of Western modernity,

2 See, among other similar concepts, Helmut Schelsky's "scientific-technical civilization" (Schelsky 1961), Daniel Bell's "post-industrial society" (Bell 1973), Rolf Kreibich's "scientific society" (Kreibich 1986), or Nico Stehr's "knowledge society" (Böhme/ Stehr 1986; Ericson/ Stehr 1992).

which closely ties societal progress to scientific and technological progress, thereby stimulating an escalating use of scientific knowledge in society (Schimank 1990; 1992). Thus, Francis Bacon's Renaissance vision of scientific research receiving generous financing from the state because of its beneficial effects on the general welfare of mankind (Krohn 1987) has finally come true to a remarkable extent.

This relationship between scientific research in search of truth and extra-scientific actors demanding useful truths does not necessarily have to be encumbered by trouble. But it always implies the possibility of trouble. Indeed, for researchers, impatient and often immodest demands to find solutions to societal problems are a disruption. Societal groups who see themselves as potential beneficiaries of the knowledge produced in a particular research area often try to instrumentalize the research process strictly for their own immediate interests. The more successful such interventions are, the more narrow-minded and short-sighted research efforts are likely to become. This poses trouble for researchers and research institutes because they are committed to the goal of attaining the best possible scientific reputation, which tends to be garnered by publishing broadly-based contributions furthering the long-term advancement of the respective research area. Within academic science in the universities as well as in many state-financed research institutes outside of the universities, this curiosity-based orientation is very strong. Consequently, the relation to extrascientific interests which demand "value for money" often becomes a source of trouble.

Moreover, in the Baconian vision, there was no presentiment that scientific knowledge might become not only useful, but harmful to society as well. This innocent, optimistic point of view can no longer be upheld. Of course there were many eruptions of distrust in science before the twentieth century (Cohen 1980). But this distrust was temporary and often articulated by relatively small and ineffectual societal groups. In recent decades, however, scientific progress has increasingly exhibited its gloomy side to society, as warfare with poison gas or the atomic bomb, fatal accidents in chemical plants and atomic reactors, or the recent damage to the ozone layer exemplify. A science-based society is necessarily also a "risk society" (Beck 1986; Schimank 1990; 1992). Moreover, the risks of scientification have given rise to social movements which attack not only the ways scientific knowledge is used by certain social groups, but also scientific research itself as irresponsible insofar as it practically uses society as its extended laboratory for often dangerous experiments

(Krohn/ Weyer 1990). The Chernobyl catastrophe as well as the Gulf war were large-scale scientific experiments, indeed (Krohn/ Weingart 1987; Weyer 1991). Thus, protests against lax restrictions of scientific research also begin to cause trouble for researchers and research institutes. Again, scientific research following its own logic of action oriented toward the acquisition of scientific reputation cannot help but perceive extrascientific restrictions of its choice of themes or methods as being troublesome to the extent that these restrictions prohibit promising work. This is especially true if researchers in a given research area are not all restricted to the same degree – for instance, if the laws regulating genetic engineering are much stricter in one country than in another.

Thus, scientific research is ambivalent to society: It is useful, but it also harbors risks. This ambivalence results from the researchers' and research institutes' dependence on external financial resources combined with their dominant interest to improve their scientific reputation. Three interrelated trends – increased costs of research, increased demands for its societal use value, and increased societal risks of the application of scientific knowledge – constitute the basic sources of trouble for those researchers and research institutes primarily devoted to the internal logic of research. Having thus sketched the practical relevance of our topic, we can now consider its theoretical relevance.

Investigating how researchers and research institutes cope with political trouble could be an important extension of an *institutionalist perspective on science* shared by many sociologists and historians of science as well as by political scientists investigating science policy. This perspective, theoretically developed especially within the sociology of science during the 1950s and 1960s,³ focusses on scientific research as a subsystem of modern society with its own roles and norms, its own communication and reward structure, its own formal organizations, and its own relations to the other subsystems of society. The institutionalist perspective stresses the distinctiveness of research as a specific type of social action – a distinctiveness produced by these components of the institutional order of the research system.⁴ What is especially

3 Initiated by Robert K. Merton, this perspective was best represented by Joseph Ben-David (Ben-David 1971; 1972; 1977: 29-193; 1991).

4 In contrast to this, the sociology of scientific knowledge which has superseded the institutionalist perspective within the sociology of science since the 1970s neglects, and some-

interesting for us are the studies using this approach which deal with structures and processes of mutual social influence between the research system and the political system (Price 1965; Weingart 1970; Greenberg 1971). It is just this interface, as seen “from below” by individual researchers or research organizations, which interests us when we ask how they cope with politically induced troubles.

But we need more than a theoretical perspective which emphasizes the distinctiveness of scientific research as a societal subsystem and deals with the manifold relationships between the research system and the political system. Both conditions are fulfilled also by the perspective of sociological systems theory as developed by Talcott Parsons and, later, by Niklas Luhmann (Storer 1966; Parsons/ Platt 1973; Luhmann 1968; 1981; 1990; Stichweh 1984; 1987; 1988). This perspective, however, denies the analytical importance of distinguishing between social entities which are able to act and social entities which can only shape action – it overlooks the distinction between actors on the one hand and institutional structures or social systems on the other (Schimank 1985: 426-432). From a systems-theoretical point of view, the research system or the political system acts, while we conceptualize each of these societal subsystems as an institutional order which shapes the actions of the actors embedded within it – the researchers or research institutes within the research system, for example, and politicians, bureaucrats, parliaments and ministries within the political system. Such an *actor-theoretical foundation* of the institutionalist perspective allows us to describe and explain the selection and the outcomes of social action with regard to the interests, interdependencies, resources, and strategies of the relevant individual and corporate actors within societal subsystems.

An interesting exception within the systems-theoretical perspective is Wolfgang Krohn and Günther Küppers’ understanding of scientific research

times even denies, the difference between scientific research and other kinds of social action (Latour/ Woolgar 1979; Latour 1987; Knorr-Cetina 1981; Knorr-Cetina/ Mulkay 1983; Lynch 1985). This approach, inspired by relativist philosophies of science, an epistemological social constructivism, and sociological ethnomethodology, does point out important similarities between social action within laboratories or scientific controversies, on the one hand, and political, economic or religious action on the other. From the institutionalist perspective, however, the sociology of scientific knowledge is not a theoretical competitor but, rather, a source of possibly useful, complementary approaches to analysis (Ben-David 1983; Freudenthal 1984).

as a “self-organizing” social system (Krohn/ Küppers 1987; 1990; Küppers/ Krohn 1992). They explicitly deviate from the usual systems-theoretical premise and state that actors – individual researchers and the research group – are the proper basic elements for an analysis of scientific research. These actors’ principal aim is to ensure the continuation of their research activities. To achieve this, researchers and research groups engage in several kinds of activities, some of which are directed toward the political system – such as, for instance, political lobbying to attain the promotion of research programs from the state. This analytical approach stressing the vital interests of actors within the research system to come to terms with actors in this system’s environment – especially political actors – is obviously a good starting point for our topic.

We would like to introduce three additional aspects which Krohn and Küppers have not addressed, but which we have found necessary for a thorough analysis of the research system’s coping reactions to political disturbances of research conditions. Firstly, Krohn and Küppers analytically disregard the fact that not only individual researchers and groups of researchers, but also research institutes and groups of research institutes – such as, for instance, the Max Planck Society – are actors within the research system. One of the reasons such corporate actors – which are often quite powerful – have emerged is to facilitate strategic action against potentially troublesome political interventions into scientific research. Secondly, Krohn and Küppers offer no analytical tools for the analysis of interdependencies of actors and the aggregate effects of the interplay of many actors’ actions. Such tools for understanding complex constellations of actors have been developed within different branches of the actor-theoretical perspective – in social-exchange theory, network analysis, principal-agent theory and game theory, to name just a few. Integrating such general analytical tools within the toolbox of an institutionalist perspective on scientific research seems indispensable to us. Thirdly, being very abstract, Krohn and Küppers’ outline disregards specific institutional factors within the research system and within its societal environment. For instance, whether a research institute is primarily financed by institutional grants or by project grants obviously has a strong influence on both the type and the intensity of resource trouble the respective political actors can cause the institute.

There are many empirical studies of the different facets of the relationship between scientific research and politics which implicitly share Krohn and Küppers’ general analytical orientation and also take the aspects neglected

by them into account to a certain extent. Some work at the Max-Planck-Institut für Gesellschaftsforschung in Cologne in the field of the sociology of science has been oriented toward formulating a new institutionalist perspective based on the latest concepts of actor theory. This approach has been applied to such topics as the institutional dynamics of state-financed research institutes outside of the universities in West Germany (Hohn/ Schimank 1990), the political promotion and guidance of medical research in different Western countries (Braun 1991; 1992), the reaction of German research institutes and research politics to promising research opportunities in superconductivity (Jansen 1990), the differentiation and political role of the Federal Ministry for Research and Technology in West Germany (Stucke 1993), or the promotion of cooperation between research institutes and industry as a new instrument of research policy (Lütz 1993). These studies found numerous examples illustrating the ability and willingness of researchers and research institutes to take advantage of good opportunities to further their vital interests: to promote institutional growth, monopolize research domains, or increase their institute's research autonomy. Occasionally, the investigations also came across situations of politically induced trouble for researchers or research institutes, especially in the studies about medical research and about state-financed research institutes outside of the universities. It is this other side of the coin we want to investigate more systematically now. We hope to complement the institute's theoretical perspective with regard to an aspect which has gained political relevance and also promises additional theoretical insights into the complex relationship between actors within the research system and within the political system. With this, we would like to make a contribution to a political sociology of science.

2 Main Variables and Analytical Framework

Our topic is circumscribed by two main variables: trouble and coping. Having used these terms in their everyday sense in the previous section, we would now like to define more precisely what they mean within the framework of our theoretical considerations.

The basic idea is familiar from psychological studies of the reactions of individuals to so-called "critical life events" such as the death of a spouse,

a chronic illness, or becoming unemployed.⁵ These stressful life events cause trouble with which the individuals somehow have to cope. Transposing this to our topic, we can start by stating that *trouble* means more than the everyday problems which researchers or research institutes face in their interactions with political actors. Examples of political actors' attempts to instrumentalize scientific research for their own interests, for example, are legion, as are those of researchers in relentless pursuit of adequate financial support for their institutes. But in order for these difficulties to be classified as trouble, they must become critical. The researchers or research institutes involved must perceive the problems as drastic violations of their vital interests. Thus, whether an event is categorized as a source of trouble for an actor depends in the final analysis upon his aspiration level with regard to his relevant interests. For example, if a research institute has no ambition to select its research topics autonomously, perhaps because the institute's corporate identity emphasizes a research mission of supporting public policy-making, even strong political interventions into the setting of the research agenda will not be experienced as trouble, but as "business as usual."

However, although the criterion for classifying something as being trouble for a researcher or a research institute can only be taken from this actor's self-defined identity, an actor may still misperceive relevant events. The factual magnitude of a problem and its magnitude as perceived by the actor concerned can differ significantly, so that an actor may be in trouble without knowing about it, or may at least be in bigger trouble than he thinks, or, conversely, may exaggerate his trouble. Whenever an analytical observer can plausibly argue that a research actor has misperceived his trouble, we have to take this into account. In such a case, one of the interesting questions is why an actor has misperceived his trouble, and for how long.

Finally, an actor's trouble may be very idiosyncratic – for example, if an individual scientist does not succeed in mobilizing a particular project grant he desperately needs to realize some research goal. Such fates will not concern us here. We shall concentrate on trouble that affects at least a considerable number of individual researchers, even though it may not affect all of them with the same intensity.

Coping refers to each reaction of researchers or research institutes aimed at reducing existing trouble. Thus understood, coping is distinguished, on the

5 Compare, for instance, Haan (1977) or Lazarus/ Folkman (1984).

one hand, from *prevention*. Prevention is only possible when the trouble has not happened yet, but has been anticipated by the actor; if he is actually able to avert the trouble, there is no need to cope. Often, however, the trouble is not foreseeable for the actors concerned, so that they can hardly intervene in advance. On the other hand, coping is distinguished from leaving oneself to one's fate, a response often accompanied by despair. This happens when an actor perceives that his scope of action is so limited that he can do nothing about his trouble. Such fatalistic *suffering*, which can be equated with letting the trouble happen, does not mean that the actor concerned stops acting altogether. But it does mean that he makes no move to change his way of acting intentionally with the aim of reducing his trouble. Although he experiences trouble, he acts as if there was no trouble. An example might be a researcher who writes one application for a project grant after another, is repeatedly rejected by the funding agency, but never tries to improve his chances by switching to another funding agency, modifying the form of his applications, or choosing a new research topic. Of course, an actor's attempts to overcome trouble may be unsuccessful, yielding, in the end, the same result as inactivity would have. But the intentions are clearly different in these two cases.

As long as an actor who endures his trouble has a definite hope that it may be eliminated or at least reduced in the future by someone else's action, his suffering is, in effect, waiting for better times. For example, a powerless actor who knows that some powerful actors are affected by the same trouble as he is, and who expects that they will cope with it successfully and, as a side-effect, will also free him from it, may assume that his suffering will not last long.

If trouble is understood as a growing discrepancy between an actor's actual situation and his aspiration level, there are two possible directions coping can take. An actor may either try to adapt his aspiration level to his changed situation, or he may try to change his situation so that it fits again with his unchanged aspiration level. An example for the first alternative of *defensive coping* might be a professor who comes to terms with his growing teaching load, which has forced him to neglect his research interests, by altering his professional self-identity. Rather than thinking of himself primarily as a researcher, he would now think of himself primarily as a teacher. On the surface, defensive coping is sometimes difficult to distinguish from a fatalistic suffering of trouble. Fortunately, this is not our problem here because we are interested in the second alternative: *active coping*, i.e. an actor's

attempt to adapt the situation to his aspiration level. Examples of this would be a research institute trying to get very involved in contract research in order to compensate for a shrinking financial resource base from institutional grants, or an individual researcher from this institute who is strongly devoted to basic research leaving the institute when it shifts over to applied contract research.

It is not only the kind of trouble an actor faces that determines whether he will choose an active or a passive coping strategy and which specific steps he will take: Two additional factors are important. First of all, the troublesome situation itself consists of opportunity structures which shape the actor's room to maneuver – for example, rights to participate in relevant decision-making bodies, the availability of alternative sources for financial resources, or competitive relations with other actors. Secondly, the respective individual or corporate actor's identity, made up of his resources of social influence (e.g. power, money, prestige) and his abilities (e.g. his inventiveness) determines his capacity for strategic action. With regard to corporate actors, the degree to which they are capable of making collective decisions that are binding for their individual members is especially relevant.

Concerning active coping, two subtypes can be distinguished according to the goal of the coping activities. Active coping may, on the one hand, be an attempt to eliminate trouble. If this is successful, active coping will have had the same result as prevention would have had – with a time lag. For instance, research institutes may protest against resource cutbacks, mobilize allies, and thereby pressure the political actors causing the trouble to change their minds. On the other hand, active coping may merely be an attempt to *adapt* to trouble: the trouble itself is taken for granted, and the actors facing it only try to make the best out of a bad situation. The research institute described above, which decides to compensate for the loss of institutional grants by turning to contract research, exemplifies this strategy.

This clarification of our two main variables corresponds closely with psychological or social-psychological theories of personal coping. As we turn to our major analytical focus, the differences in our approach will become evident. Psychological or social-psychological theories of personal coping focus on a *single actor* struggling with his trouble. They try to work out a systematic and comprehensive classification of the different kinds of coping and to analyze which kind of coping an actor chooses in response to the kind of trouble he is faced with, his opportunity structure, and his capacity for

strategic action.⁶ Sometimes these theories examine the consequences the specific coping reaction chosen by an actor has for him. Psychological and social-psychological studies, however, analyze individual coping reactions *isolated from each other*. For instance, a person with a chronic illness somehow manages his life – but usually in a social context of relevant others who do not share this kind of trouble. Often this analytical perspective is adequate. But there are other situations where a plurality of actors interacting with each other share the same trouble. Then, a new phenomenon arises which tends to be neglected by psychological and social-psychological studies because their point of reference is an individual's psychological condition: the *social interference of different actors' coping reactions*.

To illustrate this type of interference, we can take the example of a small company town in which many people have lost their jobs. Here, it would be worthwhile to look not only at how each affected worker deals with this "critical life event" individually, but also at the aggregate effects of the sum of the individuals' coping efforts, which are directed not only at solving the same problem, but at overcoming *common* trouble.⁷ One of the most interesting research questions might then be how the individual coping efforts of the plurality of actors mutually reinforce or weaken each other. It would also be important to find out whether the individual actors perceive these interferences and, if they do, whether this provokes them to coordinate their coping in order to increase its effectiveness. If many of the unemployed persons react by accepting very low wages from all kinds of employers in the region, the aggregate outcome of this might be a ruinous competition among those seeking employment. But if the unemployed become aware of this hazard and are able to organize themselves in order to prevent such competition, they might, in the end, attain a collective bargaining power which would be advantageous for each one of them.

This very simplified example demonstrates what we are primarily interested in: *the aggregate effects of the interconnected coping efforts of a plurality*

6 An excellent example is Erving Goffman's study of how stigmatized persons try to manage their "spoiled identity" (Goffman 1963).

7 In their classical empirical study of the unemployed workers of Marienthal (a small town in Austria) conducted during the Great Depression in the late 1920s, Marie Jahoda, Paul Lazarsfeld and Hans Zeisel combined both analytical concerns (Jahoda/ Lazarsfeld/ Zeisel 1933).

of researchers and research institutes affected by common trouble. From a growing number of studies investigating the reciprocal causal connections between individual actions and their combined structural effects, we are aware that the nature of aggregate effects is often very *complex*.⁸ Assuming a simple additive cumulation of single actors' coping efforts is, in most cases, clearly inadequate. To give just one example, consider the situation of researchers competing for project grants that are becoming increasingly scarce. One sensible way the researcher can cope with this kind of trouble is to try to gain a competitive advantage by investing more effort into carefully reasoned grant applications. But if everybody does this, the aggregate effect is definitely not an increase of everybody's chances, but a collectively self-defeating increase in the standards for grant applications. Consequently, for a proper understanding of many empirical phenomena we have to search for theoretically more complex patterns of aggregation.

From this point of view of the respective *constellation of actors* as a whole, we are also able to evaluate more thoroughly a single actor's chances of succeeding with his coping efforts. His relative success or failure, moreover, is theoretically not attributed to his respective actions, but to how these particular actions *match*, within the given pattern of aggregation, with the actions of the other actors involved.

This declaration of our research interest shall now be specified into a set of interrelated theoretical concepts. These theoretical concepts are deliberately not designed to apply only to situations of trouble. They can also be used for the analysis of trouble-free situations, be they situations offering good opportunities to researchers or research institutes, or be they situations classified as "business as usual." In our view, it seems to be advantageous to have one single framework for the analysis of all kinds of relationships between scientific research and politics, instead of designing specific frameworks for specific kinds of relationships. This does not exclude the possibility that the general framework can be enriched by certain specific concepts which apply only to one kind of relationship – for instance, to a troublesome relationship. We certainly aspire to do this, but we will not go very far in this direction right here because we are convinced – as will become clear from our research

8 The stimulating studies by Raymond Boudon or Thomas Schelling (Boudon 1978; Schelling 1978) illustrate this point.

approach sketched below – that such concepts have to emerge primarily from carefully studied empirical cases like the ones compiled in this book.

We begin constructing our layout of an analytical framework by distinguishing two potential *sources of political trouble*: firstly, political actors pursuing a given kind of research policy with troublesome consequences for particular research actors and, secondly, political actors in other policy areas whose actions have troublesome side effects on a given research actor's research conditions. Research policies are not only formulated and executed by the ministry responsible for research, but also by other ministries responsible for economic affairs, defense, or the health care system. The trouble caused by such policies may be intended or unintended. Policies with side effects on research conditions may be educational policies, especially with respect to research conditions at universities, which are often strongly influenced by the teaching load of professors and their assistants, or budgetary policies which may restrict the financial resources available for the promotion of research.

Different levels of actors within the research system may be *affected by political trouble*. The first level is that of the individual researchers. The second is that of the informal or formal groups made up of individual researchers. Informal groups of researchers may become quite large, as exemplified by national or international scientific communities in well-circumscribed fields of research, sometimes referred to as "invisible colleges." At some point, such originally informal groups usually organize themselves formally as scientific associations or sections of them. The most common case of a formal group, on the other hand, is a project team within a research organization. Not all kinds of informal or formal groups can be properly characterized as actors. A group can only be called an actor if it is able, either by a majority rule or by compliance with its leader, to make group decisions each member is bound to comply with. A third level of actors consists of subunits of research institutes, such as departments of a university or divisions of a national laboratory. Again, these organizational units are only actors with respect to the issues they attack with a common will. A functioning formal hierarchy within these organizational research units will ensure that their categorization as actors is valid because their formal leader is entitled to determine the common will. The same holds true with respect to the fourth level of action: research institutes as formal organizations. Finally, there may be a fifth level: groups of research institutes. In Germany, an example of such a group is the

Max Planck Society, which consists of about sixty institutes. These groups of formal organizations work essentially like groups of individuals: They can be – but are not necessarily – actors.

The different levels of actors potentially affected by political trouble are often nested. Individual researchers are often members of informal or formal groups of researchers; these, in turn, are usually parts of organizational subunits of research institutes. These subunits are parts of research institutes which may, in turn, belong to a group of research institutes. But although the different levels of actors frequently fit nicely into one another like Russian dolls, there are not always common interests among them. Neither are the interests on a higher level necessarily determined by the interests at the lower level, nor vice versa. Accordingly, a situation that means trouble for actors on one level may not mean trouble for actors on another level, although the first level is contained within the other. For instance, the closing of a research institute as a formal organization can mean big trouble for its researchers, too, because they lose their research opportunities, not to mention their jobs. But it may be that there are plenty of other excellent institutes where they can continue their work. In this case, the trouble exists only on the higher level. Conversely, if the state agency financing a research institute refuses to allow the institute to give permanent positions to researchers, this may certainly mean trouble for the researchers, especially if job opportunities in their research field are scarce. But the institute may find this policy beneficial because it allows for some flexibility in dealing with personnel.

Sometimes, even when actors on different levels are affected in the same way by particular political interventions, the reactions on the different levels nevertheless run counter to each other. For instance, a research institute may be faced with political actors threatening to close it down if it does not step up its technology transfer to industry very soon. This certainly may mean trouble for the research fellows of this institute who are interested in basic research. But when the institute as an organization reacts by putting increasing demands on the researchers to engage in transfer activities, the best of them (who will have the best chances of receiving interesting job offers) might leave. This individual coping effort could impair the institute's coping effort, which may vitally depend on the capabilities of these very researchers.

In addition, there can be mild or extreme differences of interests – including different intensities of the same interest – between actors on the same level. For example, an institute's researchers oriented toward basic research

will be affected quite differently from those oriented toward applied research when political actors call for an increase, say, in the institute's share of contract research for industry. While this could be major trouble for the first type of researcher, it may well be a good opportunity for the second type to improve his standing within the institute. Another example could be the different consequences which increasing scarcity of federal funding might have on the different kinds of member institutes of the Max Planck Society. If, for instance, the spending cuts apply mainly to the purchase of expensive research equipment, the natural-science institutes would have much more trouble than the institutes in the humanities.

All in all, a single political intervention may mean very different things to different actors within the research system, be they on the same level or on different levels of action. Some may see trouble looming, while others are unconcerned, and still others may see a good opportunity opening up. Those faced with trouble may be affected in the same way, or in different ways. This is the context within which coping occurs as a *complex interplay between political actors causing trouble and research actors affected by that trouble*. Actions causing trouble may produce coping efforts as reactions; in turn, those who caused the trouble may react to the coping, which may bring about new or intensified trouble, thus causing further coping, and so on. For instance, politicians demanding a new orientation of certain research areas according to political priorities not shared by the researchers may provoke evasive reactions: the researchers will pretend to comply with the political demands while secretly continuing to do their own thing as they see fit. When the politicians detect this, they may implement new devices for monitoring research, so that they cannot be deceived again. This may put an end to the evasive tactics the researchers had been using, but it will probably cause, depending on the individual circumstances of researchers, a new series of adaptive reactions. Some researchers may leave the respective institutes and look for new positions where they can better realize their own research ambitions; others may, from that moment, perform their research without any enthusiasm or creativity. Again, the last kind of reaction, which is perceived as work-to-rule by the politicians, may motivate the latter to install additional mechanisms to enforce an adequate level of research output – which may elicit yet another round of reactions by the researchers, and so on.

Such sequences of trouble and coping efforts, which can sometimes go on for quite a long time, have certain *effects on the research conditions*. As

stated above, we consider these effects to be complex aggregations of action which is embedded within an institutional context. Because the research conditions are the result of an interplay of many individual, collective and corporate actors on several levels of action, they cannot be traced back to any single actor and his intentions and capabilities. Although this holds true for almost all results of human action when it is triggered and shaped by interdependencies between actors,⁹ there are many constellations of actors which are structured so simply that their aggregate effects are evident to any interested observer. Two features of an actor constellation – the degree of compatibility between the intentions of the actors, and variation in the amount of social influence they possess – largely determine its complexity and, hence, the extent to which its aggregate effects are obscured.¹⁰

The higher the compatibility of intentions among different interdependent actors, the more all these intentions can be realized simultaneously without friction. The scale of degrees of compatibility can, for reasons of simplicity, be divided into two opposites. On the one hand, there are several possible relations of compatibility between intentions: Different actors' intentions can be identical without being competitive, their intentions can be complementary, or their intentions can be indifferent to each other so that none interferes with the other. In these cases, the aggregate effect of the actors' combined actions is comparatively simple, because the actors are headed, more or less, in the same direction. On the other hand, however, there are at least two possible relationships of incompatibility between intentions: The intentions of different actors can be competitive, or they can be antagonistic. In these cases, the aggregate effects often become much more puzzling because the actors are headed in opposite directions and there is no easily conceivable point where their intentions might meet – especially if there are three or more actors involved.

9 As James Coleman puts it, social interdependencies result from a "simple structural fact": "Actors are not fully in control of the activities that can satisfy their interests, but find some of those activities partially or wholly under the control of other actors" (Coleman 1990: 29).

10 The following builds upon general ideas developed in Norbert Elias' studies of "social figurations," which were applied to the topic of unintended results of action by Reinhard Wippler (Wippler 1978: 158-161, 174-175).

But even a high incompatibility of intentions can be overcome quite simply if there is a strong social dominance of one actor or a subgroup of actors with compatible intentions. The greater the difference in social influence is between the actors within the respective constellation, the less relevant the intentions of the other actors become for the aggregate effect. The intentions of the actors without significant social influence are socially neutralized. But the smaller the differences of social influence among the involved actors are, the more puzzling the aggregate effect of their combined actions becomes if the incompatibility of intentions is high.

Applying these general considerations to the constellations of political actors causing trouble and actors within the research system coping with this trouble, we can assume, first of all, that there is a high incompatibility of interests between the political actors and the researchers and research institutes. The extent of the compatibility of interests among the actors affected by the political interventions interests us more, however; as shown above, there are several combinations possible. There may be a high compatibility of interests among these actors, so that they stand united against the political actors. Or their interests may be highly incompatible: Some actors are faced with trouble, while others perceive this very "trouble" (especially if it affects their competitors) as presenting good opportunities for themselves. Or there may be an incompatibility of interests, with all actors seeing trouble, but each in different ways.

Turning to the differences of social influence, we find that political actors have the capacity to influence the actors within the research system significantly, not just by incentives, but also by directives. There may be a clear social dominance of the political actors – in this case, they will have their way. Or, the political actors may need the cooperation of at least some actors within the research system in order to effectively implement their interventions. If this is the case, political actors might make use of the incompatibility of interests among the actors within the research system by playing off those who see good opportunities for themselves against those who see trouble. If all the relevant actors within the research system are faced with trouble, but each is faced with a different kind, the political actors can also make concessions to some, thereby winning them for an alliance against the others.¹¹

11 These concessions are a kind of "side-payment" (Scharpf 1991: 20-23).

Such a policy of “divide and conquer” can even work if all relevant actors within the research system are faced with the same kind of trouble.

The extent to which the political actors predominate will determine how foreseeable the structural effects of their interventions will be, no matter how great or small the compatibility of interests among the relevant actors within the research system is. The effects will be those the political actors desire – or, at least, accept – and, consequently, those that are not desired by the actors within the research system who are facing trouble from the political interventions. The latter’s efforts at active coping will be futile. There is nothing left for them to do but to bite the bullet and come to terms with the politically induced circumstances. But the more dependent the political actors are on the cooperation of actors within the research system, the more ambiguous this tableau becomes. Now, the structural effects will depend on several factors: whose cooperation the political actors will try to win, who will offer cooperation for what price, and what kinds of social influence can be accumulated in this way. These factors – and the choices of action shaped by them – may all be contingent to some extent; consequently, there may be no clear, stable, predictable outcomes; the outcomes will always be partially accidental. The questions raised by these considerations can only be answered by turning to specific cases and analyzing them carefully.

3 Research Approach

Perhaps the best brief characterization of the research approach we are trying to realize with this book is a combination of two well-known sociological slogans. What we are searching for is a “grounded theory of the middle range.”

Robert K. Merton distinguished “theories of the middle range” from grand theories providing “... a complete vade mecum to the solution of sociological problems” (Merton 1949: 165-166). This first element of our approach formulates the goal we want to reach, signalling, on the one hand, theoretical modesty. We want to emphasize explicitly that we are definitely not trying to work out an entirely new, all-encompassing theoretical perspective for all kinds of social studies of science, but a set of theoretical propositions about some specified aspects of a limited area of social phenomena. On the other

hand, stating that we are searching for elements of a theory of our particular subject indicates that we are not satisfied with descriptions and explanations of singular historical episodes. We want to go beyond a mere compilation of cases, however well analyzed they may be. By providing a more abstract reflection about the cases and then comparing them, we wish to find general patterns of analytical relationships between trouble, coping strategies, constellations of actors, and effects of coping with trouble on the research conditions.

The formulation of our research goal connotes the course we will take to achieve it: the “grounded theory” approach, as developed by Barney Glaser and Anselm Strauss (Glaser/ Strauss 1968; Strauss/ Corbin 1990), who made a clear distinction between their approach and others tending toward purely deductive theorizing or purely inductive empiricism. Purely deductive theorizing supposes that a complete and sufficiently detailed theory exists that can be used to examine the class of phenomena at hand, so that the subset of phenomena to be empirically analyzed just has to be subsumed under this theory. In this case, there is essentially nothing to be learned from social reality because everything is already included in the existing theory. Such an approach would undoubtedly fail to answer our research questions because there is no comprehensive theory which applies to our phenomena. Purely inductive empiricism, conversely, supposes that there is a *tabula rasa* regarding the phenomena at hand, waiting to be filled with theoretical concepts and propositions. Such an approach is often as unrealistic as the purely deductive approach: This is certainly true in the case of our research questions. As we have documented here, we have some theoretical ideas about what to look for. These ideas are often still vague, and sometimes there are contradictory suppositions – but not only would it be impossible to pretend we could forget about the already existing knowledge, it would be foolish indeed not to use it as a starting point for our investigation. This is the major message of the “grounded theory” approach: In such a situation of incomplete and insecure theoretical knowledge, one should go back and forth between theory construction and empirical investigation again and again, until the theory consolidates. How often these two steps have to be taken cannot be stated a priori – the moment to stop has come if further empirical work does not reveal any new surprises.¹²

12 Bühler-Niederberger (1985) elaborates this point very clearly.

Our selection of cases to be discussed at the conference was guided by this approach. Each of the contributions dealt with a particular empirical case illustrating a typical pattern of politically induced trouble and coping strategies within the research system. Of course, each case we have selected exhibits only a fraction of the aspects we have sketched. Moreover, we could not hope to offset this deficit fully with our particular selection of cases. With such a small number of cases it is impossible to portray the whole variety of possible constellations of trouble and coping efforts. While trying to reflect the diversity of trouble in research to a certain extent, we had to bear in mind that too much diversity would make it difficult to compare the cases. The diversity results from different national contexts (France, Germany, Great Britain, and the United States), different kinds of research institutions (universities, Big Science centers, other state-financed research institutes), different kinds of political trouble (financial cutbacks, redirection of research programs, institutional change, political regulation), different degrees of success and different effects of the coping efforts.

Let us briefly introduce the case studies. The first two, by Schimank and Braun, deal with resource trouble in the university sector. While Schimank can show that the high degree of autonomy professors enjoy at German universities makes collective coping efforts rather improbable, and that individual researchers must thus resort to adaptive strategies, Braun explains in his comparison of biomedical research in Great Britain and the United States how political trouble is filtered by funding agencies and medical schools before it reaches the individual researcher. Both cases deal explicitly with a multi-level actor constellation.

That prevention of trouble is not only a theoretical idea but also, under certain circumstances, a real possibility is stressed by the two French case studies presented by Krauss and by Musselin and Vilkas. Each case shows that in the extrauniversity research sector in France there is a high potential for successful conflict avoidance and for bargaining between the elites of the research system and the political system. Krauss points, in addition, to the possibility of "mock trouble" staged sometimes when political actors perceive a need to demonstrate activism.

An example of extreme political trouble is examined at two levels in the cases presented by Mayntz and Wolf, who analyze the dissolution of the East German extrauniversity research system as a consequence of the unification of Germany. Looking at trouble at the highest level, Mayntz shows that the

East German Academy of Sciences failed to survive as a corporate actor because of misperceptions, a lack of social influence and allies, internal conflicts, and permanent pressure from a changing political environment. Wolf describes how particularistic coping methods enabled certain institutes, research groups and individual researchers within the Academy of Sciences to be partly successful in finding a new role in the unified German research landscape when the Academy disappeared as a corporate actor. Stucke's case study also involves the effects of German unification on the research system – in the West. Analyzing how the German National Research Centers have dealt with the most severe cutbacks in their history, he concentrates especially on how the interplay of coping at four levels of actors affects the respective coping strategies.

The next two case studies concern trouble as a consequence of political regulation. Hasse and Gill argue that in the case of genetic engineering in Germany, regulative trouble was not only triggered but also continually reinforced by public distrust toward the biotechnological research community and by an erosion of support from industrial users of research results. The coping activities divided the scientific community – and often even individual institutes – into opposing factions of “hardliners” and “moderates,” who mutually weakened each other's efforts. Analyzing the decisions to build new research reactors in Berlin and Munich, Gläser et al. also illustrate the relevance of intrascientific dissent, which, in their case, made it relatively easy for political actors to drag out the licensing procedure or even refuse to license the reactors. Moreover, Gläser et al. stress the extremely limited coping repertoire available to research actors faced with regulative trouble.

Weyer's case study of strategic action and actor network dynamics in space policy concludes the empirical section of this book. He shows that even successful coping may engender new trouble in the future, and that coping and trouble must be analyzed not only with respect to specific focal actors, but also by considering the whole social network in which the actors are embedded.

We take a final, comparative look at the empirical material in our concluding theoretical examination of the cases. Here, we further clarify each case analytically and group the cases according to similar patterns in order to derive theoretical generalizations which can be divided into two categories. Firstly, we expect to find conceptual generalizations which allow us to classify the analytical dimensions “trouble” and “coping.” While these conceptual

generalizations will be descriptive, we also hope to find, secondly, causal generalizations: propositions about general patterns of coping with trouble and its effects on research conditions. These generalizations will be explanatory.

Most of the contributions of this reader were originally presented at a conference entitled "Coping with Trouble" which we organized at the Max-Planck-Institut für Gesellschaftsforschung in Cologne in November 1992. We gratefully acknowledge that the conference was financed and hosted by our institute. Most of the chapters based on a conference paper profited greatly from the lively, inspiring discussions at the conference. Thus, we editors and most of the authors are heavily indebted to the discussants: Erhard Friedberg (Centre nationale de la recherche scientifique, Paris), Dorothea Jansen (Universität Bochum), Wilhelm Krull (Wissenschaftsrat, Cologne), Werner Meske (Wissenschaftszentrum für Sozialforschung, Berlin), Arie Rip (Universiteit Twente), Peter Weingart (Universität Bielefeld), Tom Whiston (Science Policy Research Unit, Brighton), David Wilsford (Georgia Institute of Technology, Atlanta), Hans-Willy Hohn and Fritz Scharpf (Max-Planck-Institut für Gesellschaftsforschung, Cologne).

Last but not least, we would like to thank Cynthia Lehmann, who did a great job of copy-editing and correcting English phrases that could sometimes be quite mysterious. With her personal mixture of enthusiasm and patience, she kept us out of a lot of potential trouble.

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