The design and delivery of inter- and pluri-disciplinary research

Proceedings from MUSCIPOLI Workshop Two

STRATA Accompanying Measures
Managing with Uncertainty in Science Policy

The Danish Institute for Studies in Research and Research Policy
2002/7

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Finlandsgade 4
DK - 8200 Aarhus N
Denmark
Phone (+45) 8942 2394
Fax (+45) 8942 2399
E-mail: afsk@afsk.au.dk

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This publication is part of a project called “Managing with Uncertainty in Science Policy – MUSCIPOLI“, which has been awarded financial support by the European Commission through the contract HPV1-CT-2001-60023 under the 5th Framework Programme of the European Community for Research, Technological Development and Demonstration Activities (1998 to 2002) and its specific programme “Improving the Human research Potential and the Socio-economic Knowledge Base” (“Strategic Analysis of Specific Political Issues”). The author[s] are solely responsible for this publication which does not represent the opinion of the Commission. The Commission is not responsible for any use that might be made of the content of this publication.

Foreword

The design and delivery of inter- and pluri-disciplinary research

This publication is part of a project called " Managing with Uncertainty in Science Policy – MUSCIPOLI ", which has been awarded financial support by the European Commission through the contract HPV1-CT-2001-60023 under the 5th Framework Programme of the European Community for Research, Technological Development and Demonstration Activities (1998 to 2002) and its specific programme "Improving the Human research Potential and the Socio-economic Knowledge Base" (" Strategic Analysis of Specific Political Issues").

In this report we present the proceedings of the second of three workshops planned within the project. The workshop was organized with the topic:
"The design and delivery of inter- and pluri-disciplinary research" and took place in Paris at La Maison des Sciences de l'Homme in May 2002.

The workshop had participation from university researchers, researchers from government research institutes, research administrators, members of research councils and members of advisory bodies, bringing together 24 participants with experiences from a variety of European countries and from the European Commission.

On the basis of the presentations collected and presented in these proceedings a number of discussions took place and a summary of the discussions and conclusions are presented in a separate chapter.

The workshop was organised by professor Hinnerk Bruhns and as coordinator of the project I want to thank him for his great effort in organising the workshop and to thank Maison des Sciences de l'Homme for their hospitality.

The report is edited by Kaare Aagaard and Karen Siune from the Danish Institute for Studies in Research and Research Policy.

Karen Siune
Co-ordinator

August 2002

Table of Contents

Chapter 5: Cross-disciplinary research in specialised institutions

Chapter 6: Summary and Discussion

Appendix

Executive Summary

”The design and delivery of inter- and pluri-disciplinary research” - Proceedings from MUSCIPOLI Workshop TWO

The STRATA-funded MUSCIPOLI-project (Managing with Uncertainty in Science Policy) hereby presents a report with contributions and discussions of a workshop focussing at cross-disciplinarity as a key operational principle in contemporary science policy. This report is the second in a series of three focussing at respectively thematic, operational and structural science policy issues.

The participants in the workshop and consequently the contributors to this report represent a number of European countries. As a mix of academics, administrators, policy developers and agenda shapers they also represent a broad variety of institutional positions in the European science policy system.

A main aim of the report is to discuss the uncertainties related to the design and delivery of a key operational principle in science policy - in this case *cross-disciplinarity*. To address this discussion the contributions to the report are structured in three main chapters covering:

- The role of the research funding level in relation to cross-disciplinarity
- Cross-disciplinary programs
- Institutions specialised in cross-disciplinarity

In the final discussion of the report a number of issues crossing these overall themes are drawn to attention. These are issues that are touched upon in the majority of the contributions.

- Objectives (why is cross-disciplinarity perceived as a key operational principle in contemporary science policy?)
- Barriers (why is successful cross-disciplinarity so difficult to achieve in practice? – what are the barriers?)
- The relationship between disciplinarity and cross-disciplinarity (what is the optimal balance between these two important operating science policy principles?)
- Instruments (which instruments are used to induce and facilitate cross-disciplinarity?)
- Definitions (what are we talking about? – addressing the widespread terminological confusion)
- Recommendations (which factors are important for successful implementation of cross-disciplinarity?)

A brief outline of main issues in the report

Research crossing disciplinary boundaries has increasingly in the last decades been perceived as a key operational principle in the design and delivery of science policy in most western countries. It is described as an operating principle that can help accomplish a range of objectives by addressing broad issues and answering complex questions, that are beyond the scope of any one discipline. Crossing of disciplinary borders is regarded as a necessary approach to solve societal problems and to increase wealth-creation, as it is expected to generate more innovative and more excellent research.

However, the contributions of the report also point to a number of potential barriers and problems in relation to cross-disciplinarity. These barriers can be found at all levels. From the structural and the institutional level to the individual level.

In a number of contributions it is emphasised, that cross-disciplinary institutions, programs or projects often experience conflicts with the traditional disciplinary science system. The lack of consistency between the cross-disciplinary initiatives and the disciplinary organisation in the traditional research system are mentioned as major factors explaining these difficulties. Successful cross-disciplinarity is difficult to achieve in practice because science policy decisions are implemented in organisational and cognitive locations, where they interact with existing structures, interests and ideas that for most parts are built on disciplinary premises.

Another barrier is found at the individual level, where incentives in the form of career opportunities are limited. Cross-disciplinary scholars are likely to experience at least some frustration at the lack of formal recognition in titles, prizes, and resources that disciplines and their institutions bestow upon their own. It is emphasised, that institutions and programs easily could become marginalized if they do not respect sufficiently the fact, that scholars make their careers within disciplines.

These barriers and problems are related to the overall relationship between cross-disciplinary initiatives and the traditional disciplinary science system. There is a duality in this relationship, where, on the one hand, the disciplinary structures limit the possibilities of cross-disciplinary initiatives, but where the same disciplinary structures, on the other hand, are the most important prerequisite of successful cross-disciplinarity. In a number of contributions it is emphasised, that successful cross-disciplinarity is highly dependent on the existence of strong, but permeable disciplines. It is also argued, that cross-discplinary initiatives only make sense if they are seen in the context of a large and diversified system of research and higher education. They presuppose that there are programs, projects, specialized research institutions and Universities with disciplinary structures. Similarly at the individual level it is argued, that researchers should cherish their disciplines identities, because it is only when they are confident of their core identities that practitioners feel safe enough to allow their borders to become permeable, without abandoning them altogether

The report furthermore describes a broad range of instruments that are used to promote cross-disciplinarity as an operational principle.

Cross-disciplinary research takes place in many settings and in many forms. Throughout the report a variety of different instruments and measures used at different levels of the science policy system are illustrated. They vary from different structural configurations at the research funding level to a multitude of programs and institutions at the research performing level - and they vary from different evaluation-methods and management principles to a number of indirect as well as direct incentives for individuals and for institutions.

Finally the report sums up a number of recommendations. Throughout the report the authors of the contributions emphasise different conditions, which contribute to the success of any successful cross-disciplinary research collaboration.

Among the most important recommendations that should be mentioned here are:

- Cross-disciplinary initiatives should be problem- or topic-driven
- Participants in cross-disciplinary initiatives should be selected for a combination of confidence in their disciplines of origin and openness to other ways of viewing the world
- Cross-disciplinarity requires time for confidence building
- Cross-disciplinary initiatives need a supportive reward structure
- Cross-disciplinary initiatives need an influential audience

Chapter 1: Introduction

Managing with uncertainty in science policy

Science policy defined as "*the collective measures taken by a government in order, on the one hand, to encourage the development of scientific and technical research and, on the other, to exploit the results of this research for general political objectives*" is a relatively new field of government responsibility. It is only in the last 50 years, that this field has been given institutional recognition through bodies, mechanisms, procedures and a bureaucratic and political staff specifically concerned with these questions (Salomon, 1977,43-46).

In these 50 years of existence, the design of science policy has seen a lot of changes of which some of the most fundamental have been observed in the last couple of decades. The changes have been thematic, operational and structural, and in the theoretical literature it has been almost commonplace to emphasize how the relationship between science and society has changed dramatically during this period. These developments have been addressed in a number of recent contributions to the field of science policy studies (Elzinga & Jamison, 1994; Gibbons et al. 1994; Ruivo, 1995; Guston, 2000 etc.). In these and other contributions it has been emphasized, how the design of science policy since World War II has gone through a number of phases or paradigms, and how the political doctrines have changed accordingly.

Even though there are disagreements in the reviewed literature concerning the distinction between the different paradigms or phases, and even though opinions differ as to which issues are considered most important and deserve to be highlighted, the bottom-line in all contributions are, that the design of science-policy has changed significantly in the last couple of decades.

It is claimed, that these changes have become manifest in all aspects of the science-society relationship, and have affected everything ranging from institutions and disciplines to practices and policies. Among the most influential are the claims, that the process of knowledge-production is changing fundamentally (Gibbons et al., 1994, 2001); that the organization and functioning of the overall research-system is changing (ex. The triple helix-literature); and that a new social contract for science is emerging, as the political system and the society in general are increasing the demands to the research system.

Along the same lines John Ziman has described how science has been going through a radical structural transition to a much more tightly organized, rationalized and managed social institution. According to him, this transition to quite a new regime started in the mid-1970s, and is still going on. The same forces for change are at work everywhere, and many of the same features have emerged in many countries. His central argument is, that there is no way back to the traditional way of managing the business of research, but there is also no obvious path forward to a cultural plateau of comparable stability. The challenge is therefore to understand properly what is happening to science. He claims that realistically, the most we can usually do, is to try to understand how an effective research system actually functions, so as to make sure that essential functions are not impeded as a result of seemingly harmless organizational change (Ziman, 1994, 249-250).

In spite of this fundamental lack of knowledge the design and management of science-policy is still rapidly changing in most countries, even though the consequences of these changes remain highly uncertain. Uncertainty has always been an inescapable part of the management of science policy, but this uncertainty seems to have become a growing factor for science policy makers, as the traditional foundations for science policy increasingly have been questioned during the last decades of science policy research. The traditional relationship between politics and science is to a higher and higher degree being set aside, but it is strongly debated if and how it should be replaced.

The MUSCIPOLI-project

The management of science policy is rapidly changing and the long-term consequences of the use of new and different forms of organisations, institutions, instruments, processes and procedures are still to a large degree unknown. As an attempt to reduce this growing uncertainty in the design and management of science policy the MUSCIPOLI project has been launched. MUSCIPOLIS aim is to provide practical insights and develop improved concepts for the understanding of the science-policy decision-making and its outcomes. MUSCIPOLI seeks to improve the understanding and management of the various complex links between science policy aims, policy-making and downstream scientific activity, output and impact.

The first activity within this STRATA Accompanying Measure is to facilitate critical comparative discussions of a selected number of science policy aims or priorities and associated scientific activities at the European level and in a variety of national contexts. These comparisons will be made at a series of international workshops, which will address the design and delivery of three different types of science policy issues, namely thematic, operational and structural issues. *Thematic issues* deal with the content of scientific activity, prioritising particular disciplines, fields and/or applied areas of research and technological development such as environmental sciences, information technology, health care, etc. *Operational issues* specify the way in which scientific activities should be performed by emphasizing principles such as inter- or trans-disciplinarity and academic-industry linkages. *Structural issues* concern the optimal functioning of the system and include, for example, the need to develop a new academic generation, to develop a cross-national research base, or to promote the role of women in science and technology.

Given that the processes involved in science policy making may (and often do) differ from one type of policy issue to the next, a thorough understanding of such processes and their downstream effects requires the examination of each. The proposed workshop series will thus consist of three separate events, focusing on each of the three types of policy issues mentioned: the first on *Priority Themes and Topics*, the second on *Support for Transdisciplinary Research*, and the third on *Building European Research Capacity*.
The three workshops share the following objectives:

- To scrutinize and compare science policymaking processes in different national and/or international contexts. The concern is with how policy is made for new directions in science. What instruments (structures and/or procedures) are used to facilitate the formulation and/or implementation of science policies, and how is the choice of such instruments determined? Which actors are involved, how do they gain access to the policy process, and what is the nature of their influence on it? How do policy actors interact, and what form does the coordination of such interaction take? Has the policy process changed significantly in recent years, and if so, how? By asking workshop participants to explore these and other, related questions, we seek to uncover the different realities of existing science policy processes, and more generally, to identify important trends in the governance of science.

- To contribute towards an understanding of the complex (and often uncertain) relationship between science policies and their downstream effects on scientific activities. Most inquiries into the downstream effects of science policies focus on actual policy decisions, or policy as a product. In addition to this, we draw attention to the possible impact of policy-making - or policy as a process - on the production of new science-based knowledge and its eventual socio-economic impact. In other words, having looked at differences in how science policies are formulated and implemented, we move on to consider whether such differences play a role in determining the downstream effects of the policies in question. In terms of achieving science policy goals and/or priorities, what is the impact of different policy instruments and how important are the various actor constellations, relations and forms of coordination? In brief, how does the mode of governance affect the governability of science in various national and/or international settings.

- To address “why” questions where these contribute explicitly to better understanding of the “how”. For example, each workshop will include discussion of the national and regional cultural contexts for setting science policy, the extent of cultural policy diversity, and the explanatory power of distinctions between, for example, restrictive, liberal, compensatory, and constructive science policy cultures (Van den Daele, 1993; Fuller, 1999).

- To make use of relevant theory through the preparation of a series of questions about the roles of principals in policy making, the extent of agency, the variety of actors, and the networks in which the various organizational actors are seen to operate. The comparative case studies to be presented at each of the workshops will all be framed within this set of issues.

- To promote dialogue and exchange between science policy practitioners and scholars, and to facilitate knowledge-sharing within and between these two groups of actors.

- To produce a set of papers which will be made public.

- To make recommendations on implications for future science policy decisions and to provide practical advice to science policy-makers for improving the management of everyday science policy uncertainty. This in turn will help them to develop more effective, ambitious and viable science policy programmes. A number of European and national science policy makers will have benefited directly from participation in one or more of the three workshops. Beyond this, one of the main objectives of this project is to produce a handbook of advice for those involved in the various stages of the science policy decision process.

- To contribute towards fine-tuning the broader science policy research and development agenda by identifying areas of enquiry that are relevant - in both applied and theoretical terms - to an understanding of the governance and governability of science.

Participation in the workshops over and above the core project group will be a balance between academics, administrators, policy developers and agenda shapers and stakeholders - representatives of industry and society oriented groups will be invited to play an active part in these workshops.

Workshop 2 – The design and delivery of inter- and pluri-disciplinary research

Where the first MUSCIPOLI-workshop and the following report addressed the question of thematic issues, focusing on the priority-setting processes at different levels in the science-policy system, the second workshop and consequently this report have focused on, what has been labelled, *operational science policy issues*.

The questions of which operating principles should be emphasized and how scientific activities should be performed are central in the management of modern science policy. Key questions for policymakers, administrators and researchers are not only thematic (what areas, themes and fields should be prioritised?), but just as well operational (how should scientific activities be performed?).

One of the most important operating principles of contemporary science policy is the aim to facilitate crossing of national, sectorial, institutional and disciplinary borders in research. This operating principle has been regarded a key instrument in science policy at least in the last couple of decades and has created increased pressure upon traditional divisions of knowledge.

It has been argued, that it is a principle of growing importance as “*the proportion of research that is interdisciplinary is increasing; collaboration – domestic and international – is rising steadily, and more*

institutions are producing research articles. Research products combine an even broader range of skills and resources indicated by increasing interdisciplinarity and collaboration between different individuals, institutions and countries". (Hicks & Katz, 1996; 402)

Similarly it has been argued that "*knowing how to fund, manage, facilitate and conduct collaborative research will become core scientific and policy competencies in the next century*" (Hicks & Katz, 1996).

In the second workshop and in this report the focus has been limited to only one of the objectives in the general aim of facilitating border-crossing research, namely the crossing of *disciplinary* borders. Consequently, *the design and delivery of inter- and pluri-disciplinary research* was chosen as the subject of investigation. By investigating this theme as an example of the question of how scientific activities are performed and how operating principles are emphasized, it is attempted to address a number of more generic issues related to the overall "Managing with uncertainty in science policy" project.

Crossing of disciplinary borders in research

Crossing of disciplinary borders in research is by no means a novel phenomenon. Some claim that inter-disciplinarity has its roots in the works of Plato, Aristotle, Kant, Hegel and other historical figures, who have been described as inter-disciplinary thinkers. Others claim that it is entirely a phenomenon of the twentieth century rooted in educational reform, applied research and movement across disciplinary borders. Some have even dated inter-disciplinarity's origins in modern times as precise as 1951, where the first publication with the term *inter-disciplinarity* in its title was published (Chubin et.al, 1986).

Even though the underlying basis of the concept can be found in ideas of a unified science and the integration of knowledge, this report will limit its focus to modern science policy and the period following the 1960's and 1970's when crossing of disciplinary borders as an operating principle became an important objective in academic as well as in research policy circles.

Crossing of disciplinary borders in research is a concept of wide appeal. However, it is also one of wide confusion and uncertainty, and even though this operational principle has been an important aim for policymakers, administrators and practitioners at the very least for 30 or 40 years, a number of central questions and problems remain unsolved. There are a limited number of studies on research that crosses disciplinary borders, and as a consequence a lot of key questions of how to organise, manage and evaluate this type of research need to be answered.

There are several reasons for this widespread uncertainty.

The most obvious reason is, that there is a general uncertainty about the meaning of central terms. Lack of agreement on terminology has been a recurring issue in the discourse on crossing of disciplinary borders. As Klein (1990,55) argues crossing of disciplinary borders in research is usually defined in one of four ways:

1. *by example*, to designate what form it assumes;
2. *by motivation*, to explain why it takes place;
3. *by principles of interaction*, to demonstrate the process of how disciplines interact;
4. *by terminological hierarchy*, to distinguish levels of integration using specific labels

Before the workshop no authoritative terminological definition was chosen. How to use the different terms in praxis was left to the participants, but they were asked to make their use of the terms explicit in their contributions - and in most cases they have done that.

In this introduction as well as in the concluding chapter the term *cross-disciplinarity* is used as a generic adjective for all research-activities involving interaction across disciplines. It is used when referring to research that spans disciplines, but without specifying the level of integration (thus comprising the whole range of cooperation from multi- or pluri-disciplinarity to inter- or trans-disciplinarity). Just as other central terms in this area cross-disciplinarity is a problematic term, because it has been used in many different ways. We will return to this discussion in the final chapter, where the issue of terminological confusion will be addressed.

Another even more important reason for the widespread uncertainty concerned with research crossing disciplinary borders is, that it very often is a marginal activity in comparison to the traditional disciplinary mode of knowledge production. It is performed across a variety of fields and areas, in a variety of public and private institutions and in a multitude of more or less formalised settings. This means that the majority of people engaged in cross-disciplinary research lack a common identity, and as a result they find themselves in a state of social and intellectual marginality. This marginality and the lack of common identity lead to a generally diminished capacity for reflection on the nature of cross-disciplinary research. Similarly, discussion of research crossing disciplinary borders literally sprawls across general, professional, academic, governmental and industrial literatures. According to Klein (1990,122) this literature tends to be atheoretical and usually lacks cross-citation to the larger body of interdisciplinary scholarship.

Obviously there is organisational and intellectual phenomena unique to single fields, but there is also a number of common problems and ideas (Klein,1990,14). The cost of ignoring these commonalities are enormous, and it is an important task to identify and discuss these questions of general relevance for a broader audience, whether it is policy-makers, administrators or researchers.

It is the objective of the workshop and this report to address and discuss a number of these issues related to the uncertainty in organising and managing cross-disciplinary research. Important questions and issues that will be addressed directly or indirectly includes:

- Objectives (why is cross-disciplinarity viewed as a key operational principle in contemporary science policy?)
- Barriers (why is successful cross-disciplinarity so difficult to achieve in practice? – what are the barriers?)
- The relationship between disciplinarity and cross-disciplinarity (what is the optimal balance between these two important operating science policy principles?)
- Instruments (which instruments are used to induce and facilitate cross-disciplinarity?)
- Definitions (what are we talking about? – addressing the widespread terminological confusion)
- Recommendations (which factors are important for successful implementation of cross-disciplinarity?)

Hopefully this report can contribute in reducing the uncertainties related to the design and delivery of cross-disciplinary research.

Structure of report - Participants and contributions

As described, a central aim in the MUSCIPOLI project is to bring together people from different national and institutional backgrounds to examine a number of important science policy questions.

Accordingly, the "*the design and delivery of inter- and pluri-disciplinary research*" workshop had participation from a number of European countries including members of southern and eastern Europe. The group of participants were a broad mix of researchers, administrators and managers and represented a number of different institutional and organisational backgrounds including the EU, national research councils, universities and specialised institutions.

Chapter 2

In the first contribution (the opening speech of the workshop) the coordinator of the MUSCIPOLI-project Karen Siune, Director of the Danish Institute for Studies in Research and Research Policy, gives a broad introduction to a number of key issues and central questions, that should be addressed in the workshop and in this report. Furthermore a number of important examples of the emergence of research areas crossing traditional disciplinary boundaries are presented.

Chapter 3

The cluster of proceedings in chapter three are all focusing at the research funding level and addressing the use of different strategies and instruments to facilitate and increase crossing of disciplinary borders in research.

In the first contribution of this chapter Kaare Aagaard from the Danish Institute for Studies in Research and Research Policy discuss the political aims to facilitate and increase crossing of disciplinary borders in a Danish context - with a primary focus on a series of attempted changes of the traditional disciplinary research council structure to a system more in favour of cross-disciplinary research initiatives.

Following that Chris Caswill, Director of Research at the British Economic and Social Research Council, reflects on changes over time within his own organisation in the structures and policies in support for research, which includes more than one scientific or social scientific discipline.

Manfred Niessen, Director of the Division for Humanities and Social sciences in the German Research Council, describes the funding structure of DFG and the institutional incentives to induce and facilitate cross-disciplinary research activity in the German system.

The last contribution in this chapter is presented by Domenico Rosetti di Valdalbero and Benat Bilbao Osorio from DG Research of the European Commission. They describe how the role of inter- and pluri-disciplinary research is recognised and aimed for at the community level, and they present an illustrative example taken from the field of energy-research.

Chapter 4

The cluster of proceedings of the fourth chapter consists of descriptions of specific cross-disciplinary programs. This chapter gives a glimpse of the variety of programs with crossing of disciplinary borders as an important objective.

In the first contribution Edward C. Page, Professor at London School of Economics and Programme Director of the UK Economic and Social Research Council's Future Governance Programme, shares his experiences with the management of a large scale cross-disciplinary research programme. Following that Steve Rayner, Professor at Said Business School and Programme Director of the UK Science in Society Programme presents the objectives of the programme he is in charge of, and reflects on a number of important lessons drawn from many years of work as an interdisciplinary scholar.

The final contribution in this chapter is from Dr. Michael Scheuermann from the Department of Psychology of Freiburg University. In his paper he shares his management experiences as scientific coordinator of the priority programme Global Environmental Change funded by the DFG.

Chapter 5

The final group of proceedings focus on cross-disciplinary research in specialised institutions. Unfortunately only French and German institutions are presented in this chapter, but even within these two countries a remarkable variety of ways to institutionalise research crossing disciplinary borders are displayed.

The first contribution in this chapter is written by Hinnerk Bruhns, who presents the structure and institutionalisation of the Maison des Sciences de l'homme Foundation in Paris. Following that Denis Bouget from The Maison des Sciences de l'Homme in Nantes presents another but rather different MSH-institution and discus the relationship between disciplinarity and cross-disciplinarity.

Johannes Roggenhofer, Executive Secretary of ZiF (*Zentrum für interdisziplinäre Forschung*/Center for Interdisciplinary Research, Bielefeld University) describes the operating principles and internal structure of the institute. Several examples of recent projects are considered, illustrating not only its mission and the character of its work but showing also successes and advantages as well as specific problems of the ZiF-approach to basic interdisciplinary research.

Joachim Nettelbeck from the Institute of Advanced Study of Berlin (Wissenschaftskolleg Berlin) explores the question of why specialised institutions focussing on cross-disciplinary research are necessary elements in the larger system of research and higher education.

Georg Thurn, Head of research Policy and Coordination of Wissenschaftszentrum Berlin für Sozialforschung (WZB), presents a discussion of the institutional concepts and organisational structures for Pluri-disciplinary research at WZB.

Ingeborg Mehser presents the structure and objectives of the Hanse Institute for Advanced Studies. She argues, that cross-disciplinarity here is a necessity in order to accommodate the varied clients of the institute and its limited and heterogenous technology base.

In the final contribution to this chapter Basarab Nicolescu, President of the International Center for Transdisciplinary Reasearch (CIRET), presents a manifesto of transdisciplinary research.

Chapter 6

In the concluding chapter a very short summary of the contributions is presented alongside a discussion of a number of central issues touched upon in the written contributions as well as in this introduction and in the presentations and discussions of the workshop.
Chapter 1 and chapter 6 have been written by Karen Siune and Kaare Aagaard.

Appendix

In the appendix an example of a cross-disciplinary project is presented by Dr. Astrid E. Schwarz from Technische Universität München. The project “Handbook of Ecological Concepts” is made in collaboration with Maison des Sciences de l’Homme in Paris.

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Chapter 2 The Opening Speech

The emergence of inter- and pluri-disciplinarity

Karen Siune
Director of the Danish Institute for Studies in Research and Research Policy

Research covering more than a single discipline can arise from several different approaches. It might start as a result of external pressure as well as from internal pressure, where external and internal refers to the outside or inside a (discipline based) group of researchers. New patterns of research cooperation are developing.

As described in several of the papers, the discussion of inter- and pluri-disciplinary research has attracted European-wide attention among science policy actors, not only among scientists but also among science policy makers. We have heard references to a political awareness of "a need" for inter- and pluri-disciplinary research to break established scientific boundaries.

The MUSCIPOLI-project studies the uncertainties related to science policy, and is interested in "**how"** science policies are designed and how they operate. In this context the increase in programmes and institutions dealing with inter- and/or pluri-disciplinary research are of relevance. Uncertainties are plenty within this area!

We hope the workshop will answer the following questions:

- How is the design of inter- and pluri-disciplinary research organised and managed across Europe?
- And what are the likenesses and differences in the structure of funding agencies, institutions and programs across Europe?
- We need to know the variety of European patterns to be better able to understand the European variations in the degree of attention to cross-disciplinarity. Or is it vice versa that we need more information about the variations in attention to cross-disciplinarity to understand the variations in structures?

The discussion, which I do hope will take place at this workshop, will give all of us additional information about Europe. The presentations will give us the picture of the role of council structures, of the funding agencies, a picture of the initiatives and the programmes across Europe, and it is my hope that in addition to this picture we will get a better understanding of why this topic is considered so important across Europe? We need a discussion and a set of clear definitions to base this discussion on.

Other questions related to the topic of this workshop could be:

- How has the design and the delivery of inter- and pluri-disciplinary research changed over the years?
- How has the traditional structure of funding organizations changed, if changed at all?
- When did structural changes take place as a result of discussions referring to inter- and pluri-disciplinary research, and what were the arguments?
- What are the consequences of the increased focus on inter- and pluri-disciplinarity? We would like to know the short term reactions (from researchers) and we would like to know the long term impact on science and on society! The Gibbons discussion on the changes from Mode 1 to Mode 2 is of relevance here.

- Will the traditional identity of the scientific disciplines disappear? And if so, will it then be a result of changes in science as such? Internalism? Or will changing patterns of research be a result of changes in university educations.
- How much will institutional and structural reforms influence the agenda for research? Or will science change as a result of pressure from the society outside the group of scientists? Will externalism dominate?
- Will the knowledge production be in the context of application? Can we talk about the “social embeddedness of science”?
- Research policy is in focus at the MUSCIPOLI-project, but there will be other types of external pressure than the political? How much will legitimacy or lack of legitimacy play a role? (The references to the Agora, where not just the partners in the triple helix discussion are present, involving the citizens as well is of relevance here (Nowotny et al. 2001))
- Is inter- or pluri-disciplinarity a consequence of the disciplines “not keeping” their boundaries clear? This criticism has been raised among the so-called traditionalists?
- Is it a consequence of researchers not knowing the proper difference and the demarcation lines between the scientific disciplines? Is the training to blame?
- Or is it a result of new themes, be they new social issues or new technical issues too wide to be kept within the boundaries of one discipline?

Demarcation lines are usually man made, and so are the structures of science advisory bodies and the structure of the research councils and other funding agencies!

The presentations at the workshop will show a variety of demarcation lines; some do we normally agree about as the line between natural science and social science. Others we do not agree about: Some countries have kept the separation between social science and humanities while others have lumped them together.

There are plenty of issues, but let us start with a concentration on the agenda:
Design and delivery of inter- and pluri-disciplinary research!

How has the national and European policies structured the design and delivery of inter- and pluri-disciplinary research?

A new research agenda can be driven by actual problems not possible to cover within one discipline, because the problems might be too big or so new that no specific discipline of a traditional kind is prepared, educated or trained to tackle the problem. But it can also be initiated as a result of an ideological orientation as described in other presentations at this workshop. In principle it could also be an outcome of changes in training and or a result of new university education. But national experiences show that new university educations usually are established later than new research areas and usually as a result of years of research crossing the traditional borders - and in that way awareness of needs for new educational programs is raised, often proposed as mixed combinations of elements from traditional study programs. In this way study programs becomes inter- or pluri-disciplinary. But not all new research fields, crossing the established disciplines, result in the creation of new study programs. Some types of research is carried out in a multidisciplinary environment, where there is great respect attached to every single discipline.

Why crossing the borders

In this presentation it has been chosen to focus on the background of cross-disciplinary activity. From where does inter- and pluri-disciplinary research emerge? My belief is that it is impossible to define one source of inspiration; so this presentation is more based on actual changes in research and research policy defined as field cases where borders of traditional disciplines were crossed looking at themes. Such developments have had an increasing impact on science policy during the latest decennials.

Some of the uncertainty in science policy is related to how the funding agencies, especially research councils based on representation of disciplines, handle this challenge. Some of the presentations at the workshop tackle especially this issue.

Ideologically determined inter- and pluri-disciplinary research activity is based on the idea that one discipline is not enough; it is based on the perception that the traditionally existing scientific disciplines are too narrow. This driving force is often associated with a critical attitude to the purification of disciplines like it exists in many research councils and the like. Often issues arising from the borderlines of the traditional research fields or traditional fields of training increases or raises this demand. From social scientists it has often been argued that there has to be an involvement of social scientists, since all kinds of science has a social aspect, either in form of consequences or context.

Generally it can be argued that consequences of research within one discipline always have to be studied by other disciplines, and many will agree that there are opportunities arising from the hard sciences giving basis for new technological oriented research, and the social implications ought to be studied of all these new technologies, says the sociologist. The research activity this calls is typically pluri-disciplinary, integrated in a form of co-operation or it can consist of parallel pluri-disciplinary activity without closer linkages.

Problem driven: problems of a kind that needs more than just one disciplinary approach; a series of societal problems within the expanding society with increased complexity has led the way. And there has been a general trend showing increased political awareness of research as a potential problem solving activity.

Political initiatives: in favour of inter- and pluri-disciplinarity have at least in some cases been due to complaints from (non funded) applicants to research councils arguing that it is due to their cross-disciplinary approach, that they are refused (this was the case in Denmark in mid 1990's). The alternative explanation offered to these refusals, given by the research councils have often been that the refused applicant did not show enough knowledge in depth regarding the disciplines.

Development based: changes naturally lead to involvement of more than one discipline. New disciplines may arise this way. This form for development can also be labelled research based.

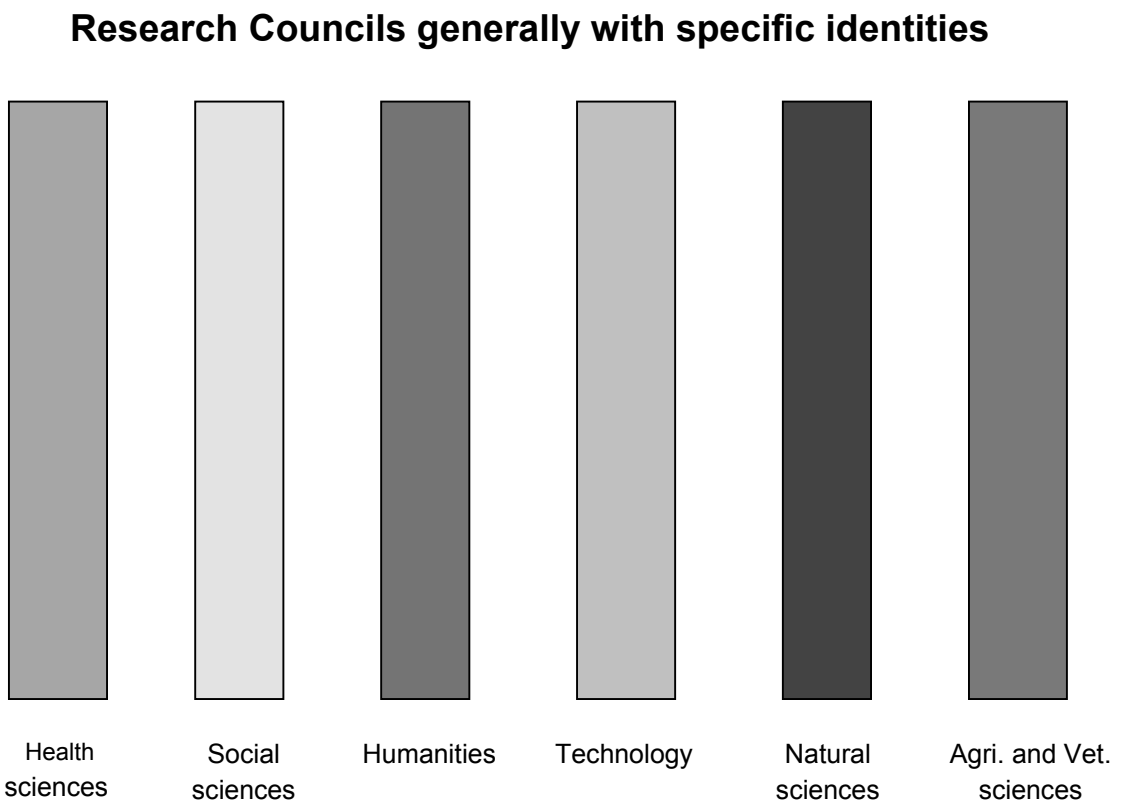
Interaction based: developments within research activities cross the scientific disciplines; communication at conferences, seminars or workshops among representatives from different disciplines might lead to more openness for new approaches, and such approaches might result in cross-disciplinary projects. If such interaction really becomes integration, then we will see new interdisciplinary research activity.

The following examples are taken out of a variety of cases from the last quarter of the century, but they are all strong cases, as far as they lead to special cross disciplinary research programs at national or international level, and they are, or at least they were at the time, when they were new, a challenge to the traditional discipline-based research councils.

Examples from the latest 25 years of increased inter- and pluri-disciplinarity

The figures below show examples where new topics for research went beyond the borders of research councils, which traditionally are bound on discipline representation (this division of disciplines is the official OECD-division used in the research-statistics). The purpose is to illustrate the challenge and the potential problems where new fields not only cross the borders of training received through university education, but where the new research crosses the borderlines between research councils. This problem does not exist in those countries that have dropped the field specific labour division, but might be a problem for those still carrying the discipline diversification, and it has been a challenge for many.

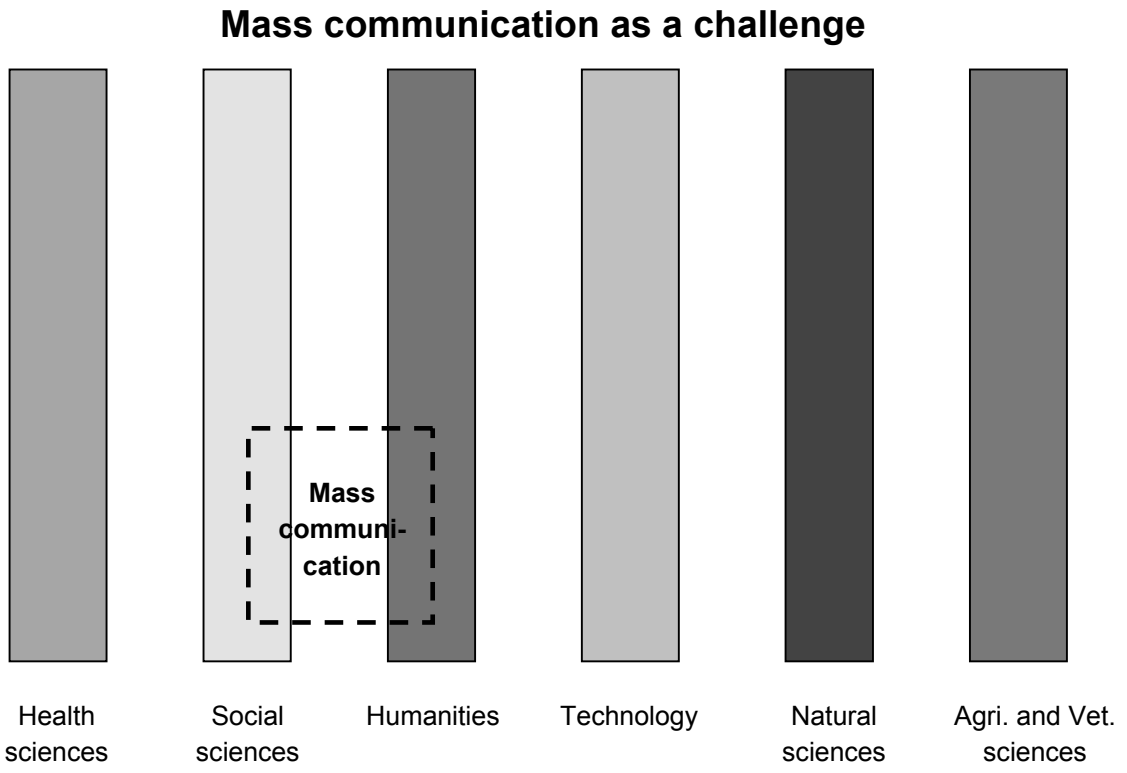
Figure 1



In most European countries we have or have had a structure with public funding channelled to researchers after applications to the “relevant” council defined as the council, to which you as a scholar belonged due to your university training and of course the relevant council for your research application.

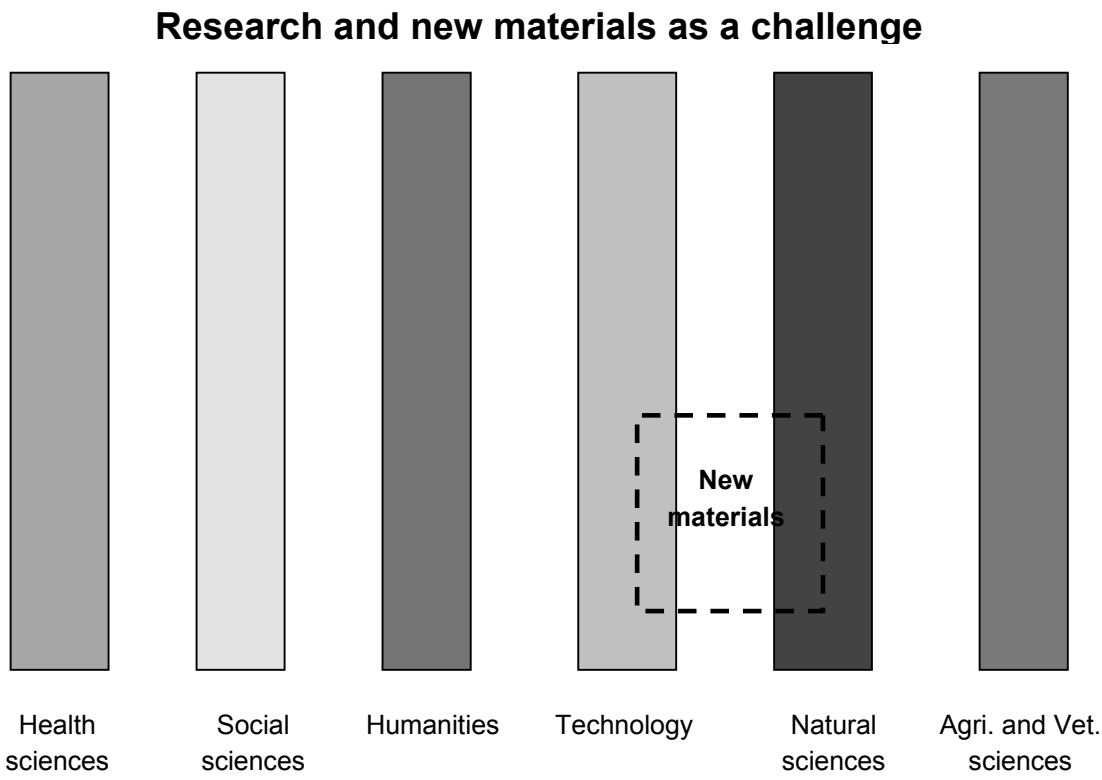
Not all European countries have had the division in the above mentioned six councils, and their names will be different from country to country; nevertheless the idea has been the same.

Figure 2



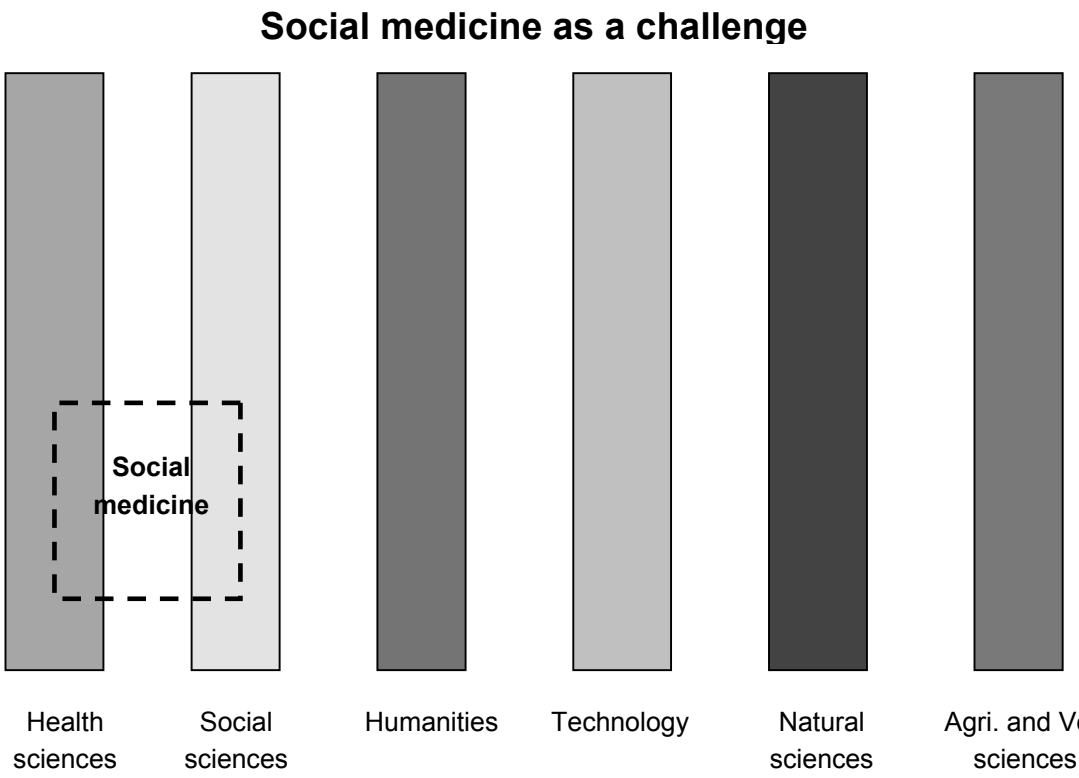
Communication has traditionally been studied within the humanities, at faculties of letters and art, but when the electronic mass media became more and more dominant, measured as the time the mass of citizens spent in front of television, then it became as object for research programmes in social sciences and then crossing the borders it became an object in itself. A series of mass communications research programmes developed both in Europe and USA in the 1970'es where the television was considered the medium with the most powerful impact on society. Mass communication became a challenge for research councils in many countries; did those who applied for money know enough about the basic social science disciplines, they asked in social science research councils and vice versa: did they know enough about humanities, it was asked in the councils, when they applied for grants there.

Figure 3



New materials have in one way or another always been the object for research and development, but in the 1980'es "new materials" became an object in itself for strategic research programmes. Was it possible for scientist coming from physics together with researchers with basic training in technology of different kinds to work together in such a way that new materials could materialize. Research in new materials did necessarily have involvement from trained scientist, often working within basic science, but the interesting aspect was whether it was possible to create new materials in a "new environments" created for that purpose; did it make the basis for interdisciplinary cooperation resulting in new product?

Figure 4

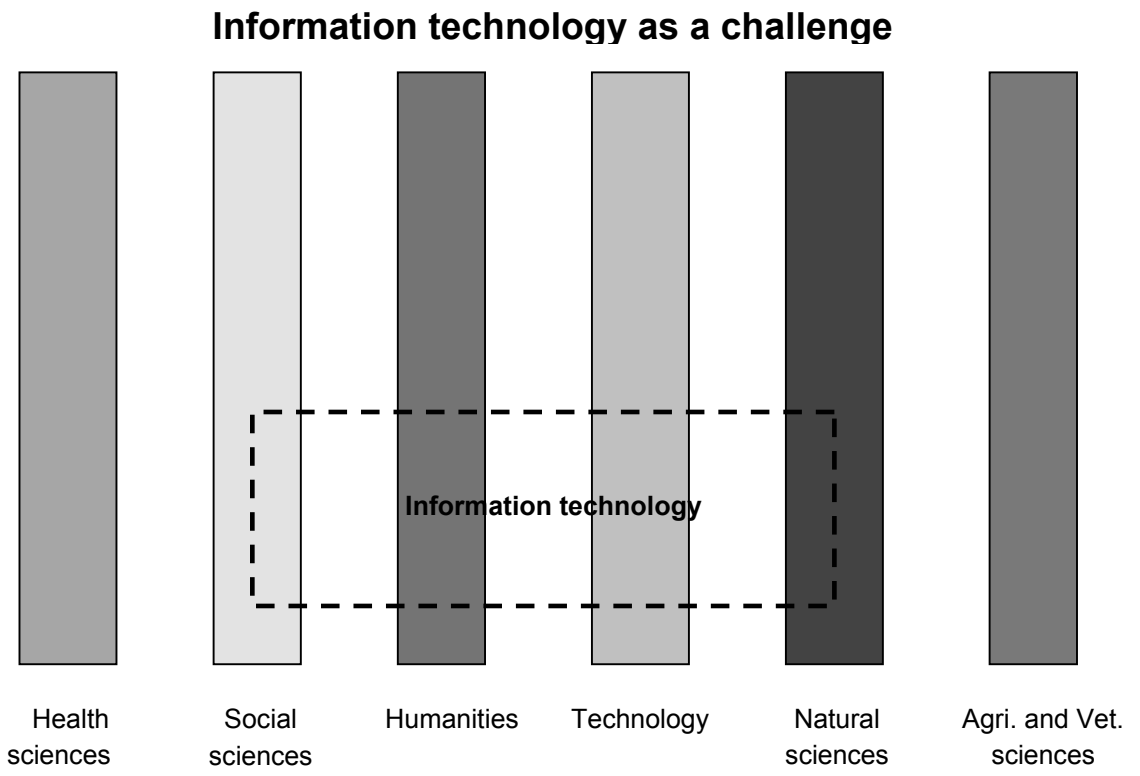


Social medicine is a third example of an area of research breaking the borderlines in this case between medicine and social sciences

Research in social medicine was originally performed by researchers trained in medicine that gradually increased their knowledge about society and the interplay between diseases and society. Later came sociologist who cared for diseases.

Social medicine never came to be as big a research area as the two already mentioned borderline breakers, and it took long time to get it acknowledged as a discipline, but in the end it turned out that in several countries special training in exactly “social medicine” became courses, in some places even obligatory, in medicine.

Figure 5

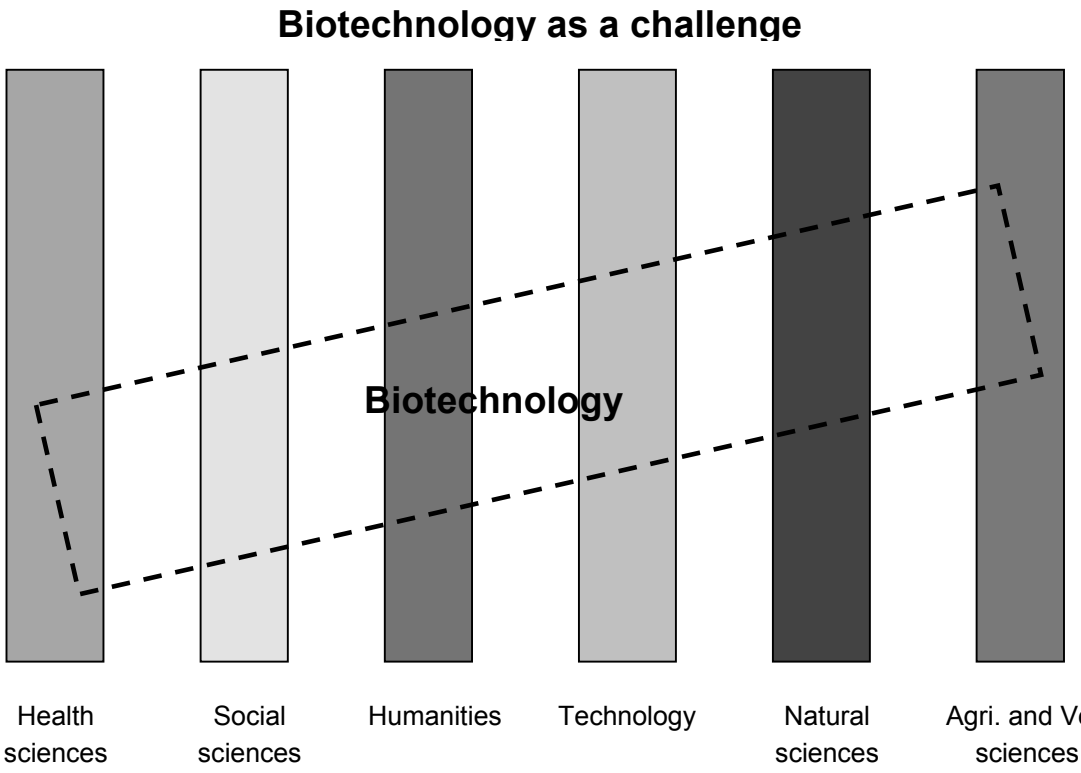


Developments in information technology happened as a result of research within physics as well as within technology as such. All the developments within information technology were followed carefully by social scientists, when it turned out that the new technology influenced the options for daily life for many different types of people.

Information technology has come to be a field of its own. It is on the agenda as an area as such, albeit it still demands researchers with training in several disciplines to cover the area.

The research area has not lead to a new university degree, but it has for sure challenged the traditional research councils. Technology was often seen as the dominant part, and the rest were to be considered as developments within physics that made it necessary or implications at the social life, that was just a result of technological developments. The humanistic perspective is only gradually on its way to get its own attention; the area has crossed the borderlines but it has not become an area in itself; so far only in research programmes, and then it is often the development of even more technology that is the driving motivation.

Figure 6



Biotechnology is one of the examples that best describe a field becoming an area of interdisciplinary research in itself. A series of national research programmes and lately European programmes have made it a reference point in itself.

The above mentioned cases illustrate some broad research area which has become reference areas in themselves in science policy and have been the object of special national or even European programs, background for the establishment of new disciplines resulting in special university studies.

Biotechnology is an example of a new research field, resulting from cooperation between different fields, since it brings together researchers from medicine, biology, technology, genetics within the human as well as the agricultural and veterinary sciences. The complexity has so far resulted in an image of being a new area in itself.

Crossing the borders of traditional disciplines have not always been easy, or maybe it is better to say, it has never been easy, but it has become easier, if somebody beliefs in it. If somebody have some expectations! The reactions from the established authorities, universities etc have been different as the above given examples have shown, and as a summary it can be said: the uncertainty in science policy is still there.

Inter- and pluri-disciplinary research is very often driven by reality, in a way we can label the process a starting with a reality provocation

The provocation from reality often perceived as social or technical problems, where a social problem can vary from a shortage for instance of energy to medical problems like infertility can lead to a challenge of the existing disciplines and not the least to a challenge of the existing research councils, based on traditional disciplines.

Science politics often come as a reaction to challenges from reality, and policies can be created related to the topic/themes for research as such. When provoked heavily it often results in special strategic plans or special programmes with reference to a “hot” issue area, where there are some expectations, some belief in science and in scientific research as the instruments worth investing in.

The criticism often heard in reaction to inter- and pluri-disciplinary work is that it shows lack of depth within each of the involved traditional disciplines. The conclusion of ex post evaluations of applications “not strong enough in the disciplines” is often the result given in the label “not qualified according to disciplinary standards” as presented in research councils based on disciplines.

The challenge for science policy given the above discussion is to make it possible for the research community to do research by qualified researchers crossing the traditional discipline borders in their approach to problems. Right now the uncertainty is still there, and it will continue to exist, whenever there is a challenge in form of new problems or new fields.

Chapter 3: Cross-disciplinarity and the research funding level

Following the opening speech, the first group of proceedings are all focusing at the research funding level and addressing the use of different strategies and instruments to facilitate and increase crossing of disciplinary borders in research. The main focus of the chapter is on the national level with a specific focus on the role of the research councils, but the last contribution lifts the focus to the international level and presents the EC as another important funding organisation.

Political attempts to facilitate cross-disciplinarity in Danish research

Kaare Aagaard
The Danish Institute for Studies in Research and Research Policy

Introduction

One of the main objectives of the MUSCIPOLI-project is to explore how policy is made for new directions in science. The focus of this second workshop is on *operational science policy issues;* or in other words the questions of how scientific activities should be performed; which operational principles should be emphasised?

Multi- or inter-disciplinarity are important operational principles in modern research policy and has accordingly been chosen as the subject of investigation in this workshop. Based on Danish experiences this presentation addresses an important question in this context: how does the political level attempt to facilitate an increased cross-disciplinary research activity?

Cross-disciplinarity, multi-disciplinarity, inter-disciplinarity and trans-disciplinarity are popular terms in contemporary research policy. Unfortunately, no authoritative definition seems to exist, and consequently the different terms are not always used in a coherent and systematic way. In particular in research policy debates the terms tend to be used quite arbitrarily, often in more or less the same meaning: as a simple distinction between mono-disciplinary research on the one side and all forms of research that cross disciplinary borders on the other (Ernø-Kjølhede, 104-107, 2001).

When referring to research that spans disciplines, but without specifying the level of integration, the term cross-disciplinarity will be used in this paper (thus comprising the whole range of cooperation from multi-disciplinarity to inter- or trans-disciplinarity). A generic term covering different forms of disciplinary integration is also the most appropriate way to address the issue in a Danish research policy context, where a clear distinction between multi-disciplinarity and inter-disciplinarity seldom is made. Accordingly the term cross-disciplinarity will be used throughout this presentation.

In the end of the presentation, however, a few comments will be made, on why a clear distinction between different types of cross-disciplinary research ought to be used, when operational priorities are discussed in research policy.

Cross-disciplinarity as an instrument in modern research policy

To facilitate crossing of borders in research is increasingly viewed as a fundamentally important instrument in the design of modern research policy in most western countries. Barriers between disciplines, institutions and sectors are seen as major obstacles to a well-functioning research-system. Underlying the demands for increased crossing of disciplinary, institutional, sectorial and national borders is often an a-priori assumption

that a political facilitation of such bordercrossing will provide conditions that are good for societies outcome of research - with cross-disciplinarity viewed as one of the essential means for research to be socially accountable and help solve the complex problems of modern society. It is argued, that the problem-driven orientation of modern research policy creates a need for an increasing focus on bringing insights from different disciplines together, as many societal problems are seen as generally falling between or spanning several disciplines. Therefore there is a demand for a more holistic approach than the more partial one, that single disciplines may be able to provide (Ernø-Kjølhede, 103, 2001).

These arguments have been heavily promoted not only nationally but also internationally through organisations such as OECD and EU. As an example, the EU's Research Commisioner Philippe Busquin has recently argued, that he is "*convinced that the greatest innovations will be derived from new interdisciplinary approaches*" (Research Europe, 2000).

The validity of these arguments is not often challenged, but an important, albeit not often asked, question is: how much do we really know about the potential advantages and disadvantages of different types of cross-disciplinary research?

Crossing disciplinary borders is often portrayed as good per se, and this is particularly true for the concept of inter-disciplinarity. But in the political praise of these operational principles it is often forgotten, or not mentioned, that crossing of disciplinary borders also can create a number of problems in the performance of research. It appears to be generally accepted, that cross-disciplinary research holds a potential for increased creativity and that this operational principle can result in an increased problem-solving ability. But on the other hand, it also holds a potential of communication and collaboration problems, and this part is often forgotten. In a recent Danish Ph.D. thesis on this issue, it is concluded that we don't know very much about in which situation which potential takes the upper hand in the cooperation (Ernø-Kjølhede, 2001). Furthermore it is often not only disciplinary borders that are crossed, but also institutional or even national boundaries, which ads even more potential difficulties to the research-collaboration. It is important to remember that advantages and disadvantages between different modes of research have to be weighed against each other.

Cross-disciplinarity in Denmark

During the 1980's it became a widespread notion among Danish research policy decisionmakers that the Danish research-system had become too sectorial and fragmented, which was seen as damaging to innovative collaboration and mobility. The public research effort was seen to suffer from a lack of integration between the sectors of the various funding ministries and an insufficient cooperation, competition and mobility between researchers, disciplines, research units and institutions. This was a serious dysfunction of the system, considering the widespread policy belief that renewed industrial growth should be based on key "generic" technologies for which basic university research played a key role, such as information technology, biotechnology and materials science (Grønbæk, 74, 2001b).

As a consequence, it was regarded as highly important to design and implement a new more strategic and integrative research-policy with the ability to reduce the consequences of the barriers that were institutionalised in the Danish research-system. Accordingly the shifting governments in Denmark since the 1980's have been putting increasing emphasis on breaking down these boundaries in the research-system with the aim of creating an integrated and coherent system in which researchers can cooperate freely across the disciplinary, institutional and national borders.

In this paper I will focus on the *political* efforts to facilitate and increase cross-disciplinary research activity in Denmark, but it would be mistaken to argue that the drive towards crossing disciplinary borders in research

has been entirely politically initiated from the top down. There are good intellectual reasons within disciplinary science itself for cooperating and integrating research across the disciplinary borders, but the bottom up pressures for increased cross-disciplinarity will not be directly addressed here (Ernø-Kjølhede, 103, 2001).

It is also important to note that in Denmark the efforts to increase cross-disciplinarity almost always are addressed as an integrated part of a more superior aim to generally facilitate bordercrossing in the research system, where efforts to brake down institutional and sectorial barriers are other important aims. Increased cross-disciplinarity is thus only one of the objectives of the initiatives I will discuss in the following sections, and in practice it can be difficult to distinguish between these different objectives.

Basically the political attempts to facilitate increased crossing of disciplinary borders in the Danish research system can be divided into two categories. On the one hand aims of facilitating cross-disciplinarity have been pursued by several attempts to change the organisational structures at the funding level to a system more in favour of this operational principle, and on the other hand a number of more direct means to increase cross-disciplinarity have been put to use in the form of funding of specific initiatives and different kind of programmes. The paper focuses mainly on the attempted organisational changes, whereas the means directly addressing the research performing level will be treated more briefly.

Attempts to change the Danish research council structure

The political efforts in Denmark to change the organisational structure at the research funding level to a system more in favour of increased cross-disciplinarity have in particular targeted the research council system. This is where the main responsibility for initiating and funding cross-disciplinary research traditionally has been placed, and as the primary intermediary bodies at the interface between politics and science the research councils in Denmark are in a key-position, when a political aim as the aim to increase cross-disciplinarity, have to be implemented.

The Danish research council-system has a fundamentally disciplinary structure and has existed more or less unchanged since the 1960's. It consists of a total of six research councils, one for each research field (natural sciences, engineering, medical sciences, social sciences, agricultural sciences, and the humanities). The research councils have a funding function in connection with the allocation of programme funds and an advisory function in their respective research fields, as well as cross-disciplinary. This organisational structure has for a long time been considered an important part of the problem of fragmentation in the Danish research system. The role of the weakly coordinated research council system in the larger research-system has been heavily criticised. The councils have been seen as too closely connected to the universities, reflecting the academic organisation into disciplinary departments and faculties, and most important in this context, the fundamentally disciplinary structure has been seen as a hindrance to an increase in the cross-disciplinary research activity.

Since the mid-1980's aims from the Government of loosening the disciplinary and institutional linkages of the councils and, correspondingly, strengthening relations between disciplines and between different sectorial and industrial research areas have been a recurring theme in science policy debate. The government has tried, among other things, to increase the representation of applied research in the councils and to merge existing councils into more cross-disciplinary and strategic configurations, but even though minor changes have happened, the fundamentally disciplinary system has remained (Grønbæk, 76, 2001b).

While the shifting governments have tried to establish the institutional prerequisites for a more strategic, integrative research policy, the research councils generally have held on to a more responsive, disciplinary type of policy. This traditional research council policy has emphasised the bottom-up initiatives of the

scientists and the use of internal scientific and disciplinary criteria for funding decisions, rather than strategic priority-setting in terms of social and economic relevance (Grønbæk, 2001).

In 1989 as well as in 1995-1997 the Danish Government tried to change this existing disciplinary research council structure into fewer and broader councils, but in both cases it proved impossible to create a structure more in favour of cross-disciplinarity.

In the following I will focus on the most recent example, but the account of the 1995-97 debate is in many ways identical to what happened in 1989, in the sense that the same arguments for and against a more cross-disciplinary research council structure can be found, and in the sense that both attempts ended up as failures. One important difference, however, is that in 1993 the first Danish Ministry of Research was established. One of the main explicit aims of the new Ministry was to strengthen the coordination in the fragmented research system and to increase cooperation across disciplinary, institutional and sectorial borders, but initially the new Ministry was not given sufficient power to change the functioning of the research system, and accordingly it did not succeed in its first attempt to induce changes at the research council level.

A main aim behind the 1995-1997 proposed changes was to create a research council structure that could play a more active role in coordinating the Danish research system and formulate and mobilise a cross-disciplinary effort on politically prioritised areas, but among central actors there was a fundamental disagreement on whether such far reaching changes were needed at all.

The Ministry of Research and other advocates for organisational change argued, that new challenges in the scientific, societal, economic and political development necessitated a restructuring of the research council system. They believed, that new departures increasingly were found, where approaches, methods and theories from different disciplines were combined, and that the existing fundamentally disciplinary structure was an obstacle to obtain these new departures. It was argued, that the existing disciplinary structure was a relic of a past, where research was correspondingly disciplinary, but that the challenges of today required increased crossing of disciplinary borders in the performance of research. As an important objection to the disciplinary structure it was emphasised that the traditional division of disciplines in the research council system was unsuitable to cover new important cross-disciplinary research fields such as the environment, traffic, food, welfare and ICT. Areas that according to the advocates for change, often fell between two or more research councils. A proposed new structure with three broader research councils was seen as better reflecting the demands from the political system and society.

On the other hand, the opponents of structural changes argued, that a disciplinary organisation of the research councils was necessary to support the scientific development, and that a strong disciplinary fundament was a prerequisite of high quality cross-disciplinary research. It was argued, that the central part of research is conducted in relatively specialised disciplines, and that it is this basic disciplinary research, that later becomes a part of cross-disciplinary projects.

One of the strongest opponents of structural changes, the research council of the Humanities, even called it a political invention, that new departures were more likely in a cross-disciplinary context, and indicated that no clear evidence supporting this claim had been presented.

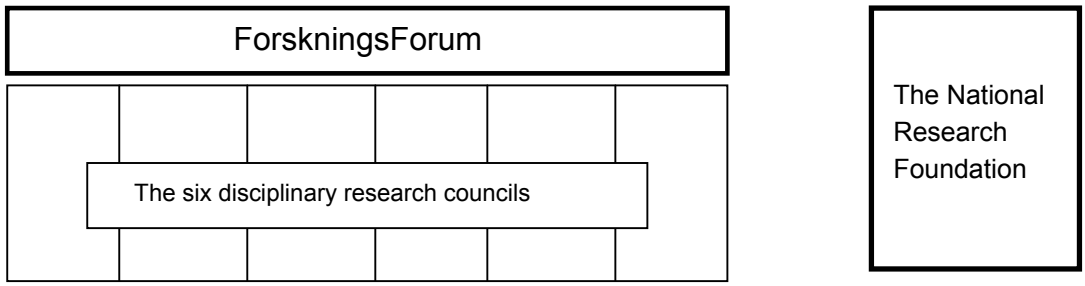
The research councils acting in concert were less sceptic towards the value of cross-disciplinarity, but they pointed out that in their view new scientific departures did not happen *between* traditional disciplines, but instead by combining approaches, methods and theories from different disciplines. Therefore, it was argued, it was still necessary to use the well-established disciplinary quality-criteria as a starting point for funding procedures. Cross-disciplinary initiatives would in most cases require a simultaneous evaluation in different

disciplinary research councils, and these procedures were already well integrated in the disciplinary research council system, while the alternative would be evaluation in a number of subcommittees.

After lengthy discussions it became clear that, just as in 1989, a political majority for the proposed merger of the research councils could not be found. As a compromise a body above the six disciplinary research councils were this time established. With one representative from each of the six research councils and seven externally appointed representatives the new body “ForskningsForum” got the explicit responsibility of cross-disciplinary advise and the responsibility of establishing cross-disciplinary programme committees across the boundaries of research fields, though without any real funding function. Further more the research councils were instructed to work out multi-annual cross-disciplinary strategy-plans for the single councils as well as for the research council system as a whole.

The body above of the research councils can in this light be seen as an attempt to make a strategic-bordercrossing corrective to the responsive-disciplinary basic structure of the councils (Grønbæk, 2001a). This marginally changed research council system has since 1997 worked alongside the National Research Foundation that was established in 1991 with funding of basic research as the main objective.

Figure 1. The current Research Council Structure



In a historical perspective, the attempted changes of the research council system confirm a pattern in the development of the research funding and advisory system: While the general advisory bodies have been coming and going, the disciplinary research councils have remained remarkably stable. Thus their number and basic structure are the same as when they were first established in the years following World War II. In contrast, there has been a succession of research advisory bodies, each attempting to strike a new, more stable balance of relations with the research councils and the ministries (Grønbæk, 2002).

Before I move on to the question of the future organisation of the research council system, a few comments will be made on the use of other means to increase the cross-disciplinary Danish research activity.

Means to increase cross-disciplinarity at the research performing level

Even though the Government so far has been unable to change the traditional disciplinary structure of the research funding system, other and more direct means to increase cross-disciplinarity in Danish research have been put to use. To compensate for the structural shortages and the general scepticism towards cross-disciplinarity in some parts of the research council system, the government has been looking for different means to reach its goals - sometimes by attempting to circumvent the research council-system.

Before the more recent means to increase cross-disciplinarity are addressed, it should be mentioned, that the first major steps to institutionalise cross-disciplinarity in Denmark were taken rather early, when in the

early 1970's two new Danish universities with a cross-disciplinary structure were opened. The basic principles for establishing the two new universities were much the same, as the ones put forward today; that the scientific as well as the societal agenda should not be limited by disciplinary borders (Andersen, 8,1996). It is important to notice, however, that the cross-disciplinary structure was favoured as much for educational reasons as for research reasons. In spite of the opening of these new more cross-disciplinary universities it took almost 15 years for the next major cross-disciplinary initiatives to appear in Denmark.

In the mid-1980's a number of large scale cross-disciplinary research programmes were launched on areas such as biotechnology, materials, food-technology, energy and the environment. In the Danish ministerial system it was the Minister for Education and, after the establishment in 1993 of a ministry specifically for research, the Minister for Research who assumed responsibility for the new cross-sectoral and cross-disciplinary research policy. Parliament was willing to allocate considerable funds for the purpose, primarily in the form of these large-scale research programmes and cooperation was initiated between ministries and with the Danish research councils.

During the 1990's the political dissatisfaction with the disciplinary research council structure grew. As a consequence of the lacking institutional structure in favour of cross-disciplinarity and the existing systems inability or unwillingness to adjust to the new societal demands, the government and the parliament increased the political steering through a large number of different programmes. A main aim in these so called "Research packages" was to enable bordercrossing research in general, and cross-disciplinarity in particular. But with more and more decisions taken at bureaucrat-level in the funding ministries this led to tension between the involved ministries and the research council system. The latter was wary of further political encroachment on what they considered to be a time-honoured right of the scientific community to govern itself. The research councils had the impression that the ministries were generally more interested in getting them to rubber-stamp its initiatives, than in giving them real influence (Grønbæk, 76, 2001b).
The programmes in the Research Packages were heavily criticised for being too specific in themes, too small, too short-term, lacking scientific quality and adding even more to the fragmentation in the Danish research system.

In the last few years, however, a political lesson appears to have been learned from this critique. In a recent broad political agreement it is emphasised, that the narrow cross-disciplinary programs formulated at the bureaucratic or political level should be replaced by fewer, broader and larger programs – and so far the political system appears to be willing to live up to this policy-statement.

Alongside the political agreement a new mean was introduced to increase cross-disciplinarity in Danish research. Under the label "Larger, border-crossing research-groups" quite substantial funds were allocated to what has been called a new flagship in Danish research. The programme covers four broad thematic areas and only border-crossing networks of researchers can apply for funds. In this case it is accordingly evident how the operational principles are at least as important as the thematic priorities in the design of the initiative.

But from a political viewpoint, the lesson of larger and broader research programmes makes a research council structure in favour of cross-disciplinarity even more important, since the attempted more direct steering has failed as a mean to increase research that cross disciplinary borders. Accordingly it is still a widespread belief that more fundamental structural changes at the research council level have to be carried through if the full cross-disciplinary potential in Danish research should be exploited.

The future structure of the Danish research council system

So even though it has so far proved impossible to change the existing research council structure, the discussion of the future organisation of the system is far from over, and new attempts to carry through changes more in favour of cross-disciplinarity can be expected in the near future. The body above the research councils has not been able to decisively change the functioning of the system and with a new Danish Right wing Government, which already has proved itself very eager to carry out changes, there are strong indications that the institutional continuity of the research council structure finally has come to an end.

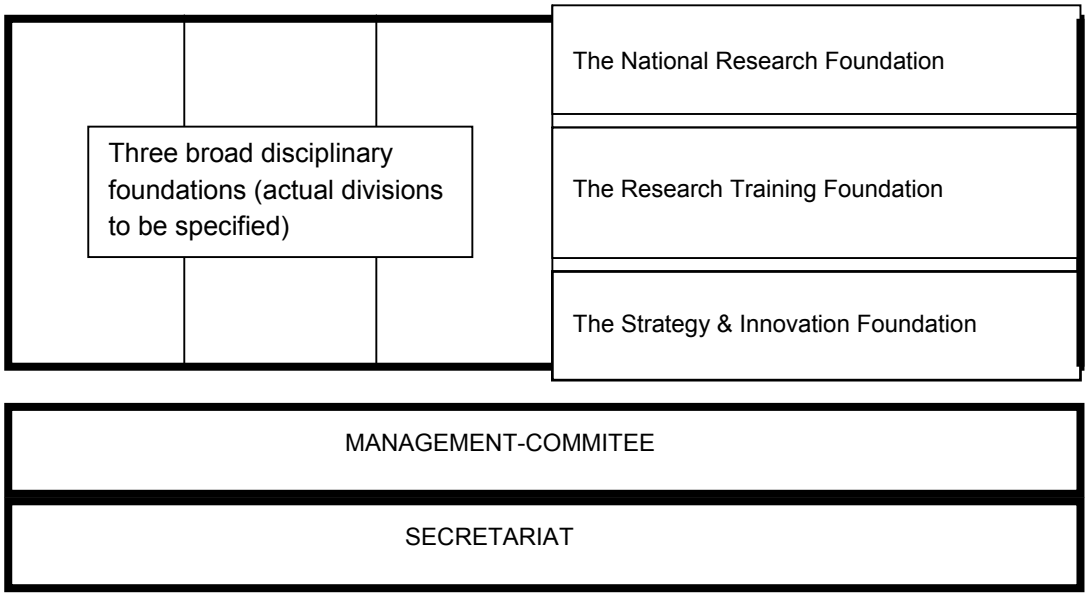
As a consequence of these indications there is a growing unrest and uncertainty in the Danish research policy system at the moment, where central actors are trying to affect the agenda and the coming decision-making process by putting forward their own proposals for a future research council structure.
In the following I will briefly describe two of the most important and most interesting new proposals. The chosen proposals are from respectively The Danish Research Commission, which was asked of the former government to propose a new structure; and the Danish Research Council, which is the main research policy advisory body.

Recommendations from The Danish Research Commission:

As a part of a proposal of a more general reform of the Danish research system the Danish Research Commission recommends to strengthen and simplify the current research funding structure. It is proposed that the present six government research councils, the National Research Foundation and the Danish Research Training Council should be merged into a single organisational structure. This structure is to consist of six foundations: there will be three disciplinary councils, each concentrating on a broad range of research to be further determined; plus a National Research Foundation concentrating on major research projects at the highest international level; a Research Training Foundation with the task of strengthening the development of researcher training and, finally, a Strategy and Innovation Foundation to support the more strategic initiatives concerning the renewal and reorganization of research.

In the proposal it is emphasized, how the recommendation that there should be three foundations, each concentrating on a broad range of research, represents a simplification compared with the present six research councils. It is claimed, that the three foundations with specialised functions will correspond to already existing activities, and that the new organisation will promote coordination and synergy among the various sources of finance. The interaction between the three broad foundations and the foundations with specialised functions is to ensure that the total research advisory system will satisfy the requirements of research as well as those of society.

Figure 2. The New Danish Research Council Structure as proposed by the Danish Research Commission



With this proposal the Danish Research Commission aims to simplify the research council structure without changing more than necessary. This has resulted in a proposal, where existing institutions are taken so much into consideration, that the wanted simplification can be hard to see in reality. Even though the six disciplinary councils should be reduced to three, two new foundations are still created and some funding responsibilities are moved from the disciplinary councils to the specialised foundations. As a consequence it can be feared, that this proposal, rather than simplifying the system, can result in an even more fragmented research funding structure.

In the proposal the Danish Research Commission also avoid the discussion of how to make the actual division of disciplines in the three broad disciplinary councils, since disagreement on this issue was one of the main reasons for the failure of the two previously rejected attempts to change the research council structure.

Proposal from The Danish Research Council (the main advisory body):

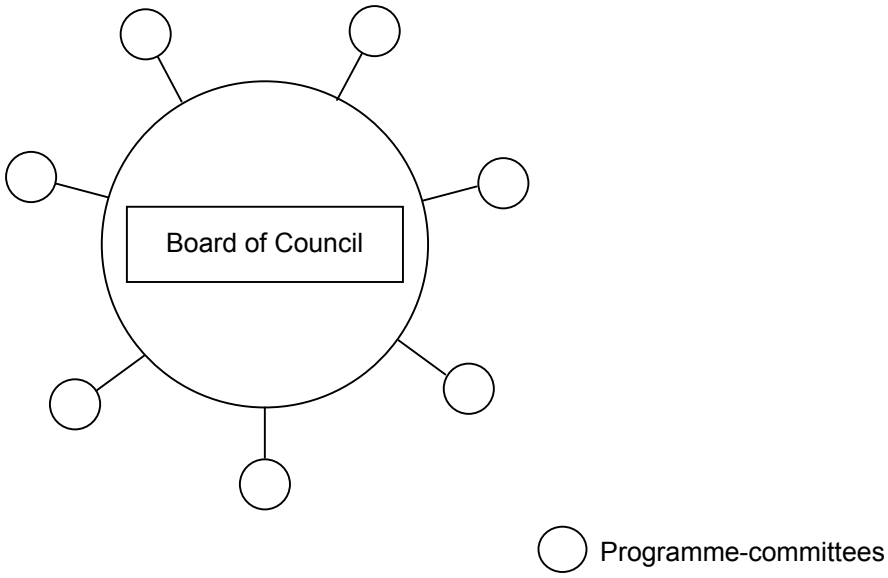
As a response to the proposal from The Danish research Commission, the Danish Research Council has, on its own initiative, proposed a way more far-reaching reorganization of the research council structure. The Danish Research Councils propose to establish a far simpler research council structure with only two research councils:

- A mission-oriented research council focusing on strategic research and research programs based on top-down initiatives.
- A science-oriented research council focusing on bottom-up processes and curiosity-research.

The mission-oriented research council

The mission-oriented research council is to consist of a number of research-programmes defined by the Parliament and the ministries. The board of this research council will be responsible for naming members of the programme-committees, and for negotiating the design, implementation and funding of the programmes with the sources of funding (typically the ministries).

Figure 3. The mission-oriented Research Council

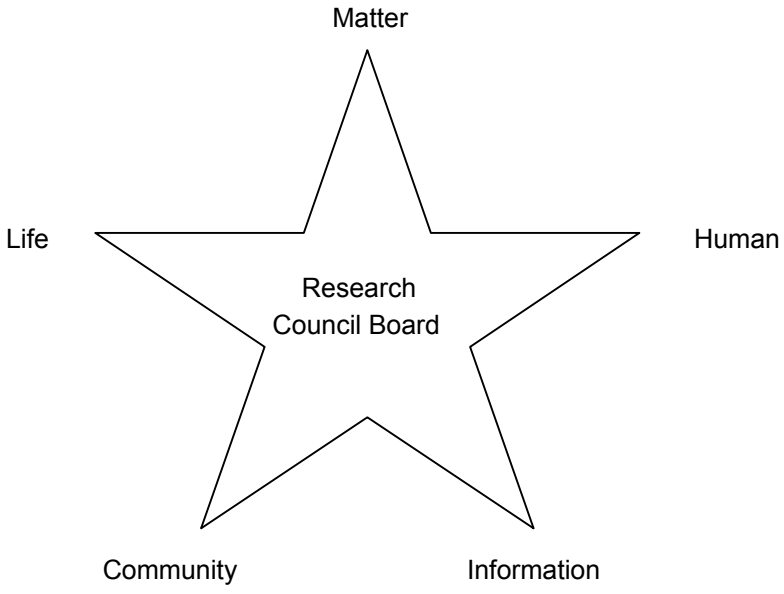


The science-oriented research council

On the other hand, the proposed science-oriented research council will cover all research-areas, and it will call for applications without specification of themes. The council shall support research at the highest international level, and evaluate applications solely on the basis of the scientific potential of the project.

According to the proposal all applications should be sent to a joint council-office with the responsibility of distributing them to one of five thematic area-committees. The Danish Research Council emphasizes that these areas should be broad and crossing contemporary disciplinary-, faculty- and research council boundaries. They have named the five proposed research areas *Information, Life, Human, Community and Matter*.

Figure 4. The science-oriented research council



A proposal to the actual division of disciplines into the five thematic research areas can be seen in Table 1. It is important to note, however, that the applicants own disciplinary identity or institutional basis should be irrelevant to the distribution of the applications. Only the scientific pivot-point of the applications will decide in which thematic area the actual evaluation should take place.

Table 1: Division of disciplines in the science-oriented research council

Information	Life	Human	Community	Matter
Computer science	Biophysics	Philosophy	Anthropology	Astronomy
Didactics	Biochemistry	Food	Architecture	Physics
Informatics/ electronics	Biology	Humanistic medicine	Archaeology	Geography
Communication	Biomedicine	Clinical medicine	Building/townplanning/ physical planning	Geology
Linguistics	Botanics/forestry	Psychology	History	Chemistry
Media	Pharmacy	Religion	Law	Mathematics
Languages	Food-production	Ethics	Art & Literature	Materials
Statistics	Veterinary-science		Political science/Sociology	
Theory of Science	Zoology		Community medicine/ epidemiology	
	Ecosystems		Economics	

This proposal from the Danish Research Council aims at a total rethinking and reorganization of the research council system without taking already existing bodies into consideration. The proposal will definitely spark controversy, but may not be un-influential as the general views of The Danish Research Council in a number of areas seem to be very much in line with the ideas in the new Government

Concluding comments

A review of the attempts to facilitate increased cross-disciplinarity in Danish research is not a tale of political success. The Government has repeatedly attempted to correct or compensate for the traditional disciplinary structure of the research councils: It has several times proposed the reconfiguration of research councils, and it has several times failed. It has instead chosen to channel research funding through "strategic" cross-disciplinary programmes, involving several research councils, ministries, agencies as well as private companies; and it has required the research councils to implement cross-disciplinary priorities by means of multiannual "strategic plans (Grønbæk). But the lack of success in establishing a research funding structure in favour of cross-disciplinary research seems to have influenced the design of the actual cross-disciplinary initiatives during the 1990’s.

Despite the previous failures to restructure the research funding system, the pressure for organisational changes is still at the forefront of the research-policy agenda, where powerful actors at the moment are preparing the ground for the next battle of the future structure of the Danish research council system.

Finally I will return briefly to the question of different types of cross-disciplinary research that was touched upon in the introduction. This discussion addresses the confusion in terms, or the lack of clarity when policymakers are requesting increased cross-disciplinarity.

An important lesson is that decision-makers have to take account of what kind of cross-disciplinary research they are requesting. It makes a difference, whether we are aiming for multidisciplinary research or inter-/ trans-disciplinary research. It seems reasonable to believe, that there is a trade-off between these modes of cross-disciplinary research. Put simply, it can be argued, that the more integrated the collaboration of different approaches, methods and theories, the bigger the barriers and potential problems, that have to be overcome, will be. On the other hand it can also be argued, that the more integrated the collaboration of approaches, theories and methods the bigger the likelihood of creating not only more economically or socially useful knowledge, but also more scientifically interesting knowledge.

This distinction between different types of cross-disciplinary research is also important when a future research council structure is discussed. While a fundamentally disciplinary structure might function as the basis for multi-disciplinary research, it could be argued, that a more cross-disciplinary organisation of the research council structure should be preferred if the facilitation of increased inter-disciplinarity is a main aim.

So far very little is known about the effects on the quality of research of different organisational structures and different operational principles, and further knowledge on this subject is an important and necessary input to the science policy decision-making process. Hopefully this MUSCIPOLI-project can be one step of the way.

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Decisions across Disciplines: Working on the Puzzle

Chris Caswill *
Director of Research at the UK Economic and Social Research Council

"Interdisciplinary is very puzzling. It is a simple concept, which every scientist understands. It is … as widely applauded as apple pie and motherhood. No effort is spared in officially fostering it. Yet it seems extra-ordinarily difficult to achieve. Why is that? What is standing in the way…? (Ziman, 1999).

Summary
Support for research which includes more than one scientific or social scientific discipline is an example of science policy in action. This policy is discussed in the context of the social sciences in one country, the United Kingdom. It focuses on changes in structures and policies over time, within one influential organisation, the UK Research Council for the social sciences. To understand these changes, their impact and their contribution to current policy and practice, the paper looks beyond the internal organisation and structure of the policy agency to the behaviour and motives of key actors, and the relationships between the Council, its principal-Ministry and the academic research system to which it allocates its funds. It analyses the extent to which structure is important, and the way policy decisions interact with the interests of key actors and with the external environment. This historical, structural and political analysis helps to explain the Ziman puzzle about why research across the disciplines is difficult to achieve.

Background
The Economic and Social Research Council (ESRC) is the largest single funder of research in the social sciences (here taken to include economics) in the United Kingdom. Its research budget in 2002-3 is £62 million. This does not include ESRC support for PhD training, for which a further £25M is provided. ESRC currently supports 28 Programmes and Priority Networks and 22 Centres, and makes approximately 230 new responsive Research Grants a year. This programme of work is delivered by three multi-disciplinary Research Boards, with members in varying proportions from the academy and from the public and private sectors outside it. There are no discipline committees in the 2002 ESRC research structure. Fixed-term commissioning panels are also always established with a multi-disciplinary and multi-sector mix.

SSRC to ESRC
The Council in 2002 looks very different from the organisation set up in 1965 as the Social Science Research Council (SSRC). Up until then there was no Research Council for the social science in the UK (Nicol 2001). The SSRC was set up in response to a report from a Committee chaired by Lord Heyworth, a prominent industrialist. (HMSO, 1965). Heyworth discussed the social science disciplines and displayed some very modern scepticism about the tendency "to grow apart and to concern themselves with distinct aspects of society". (Op.cit, p.4) The Report also believed that the social sciences were likely to become more interdependent (op.cit. p 4).

However the new SSRC was quickly established on disciplinary lines, with very little structural support for interdependence. Within the first year, the SSRC Council set up ten subject committees, reporting directly to Council. Council in turn soon became comprised largely of the Chairman of these Committees.

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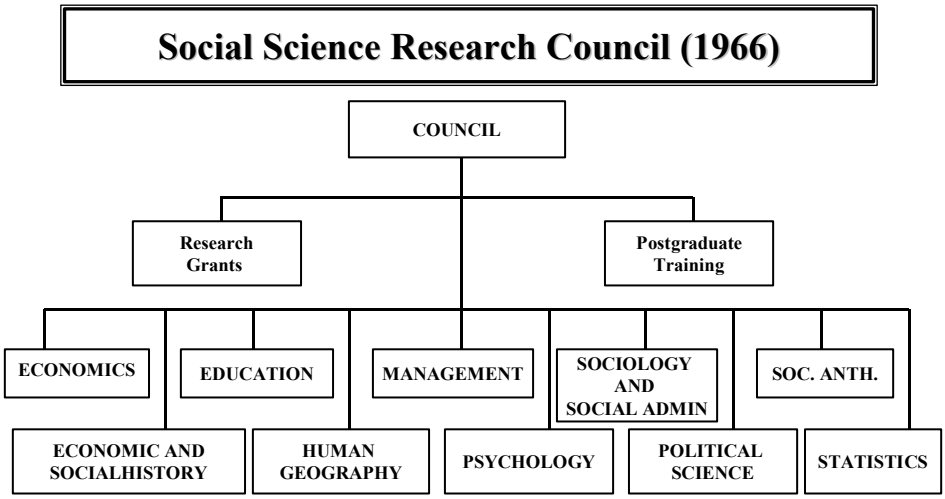
* *The views expressed in this paper are his and not necessarily those of the Council, which has no responsibility for the contents.*

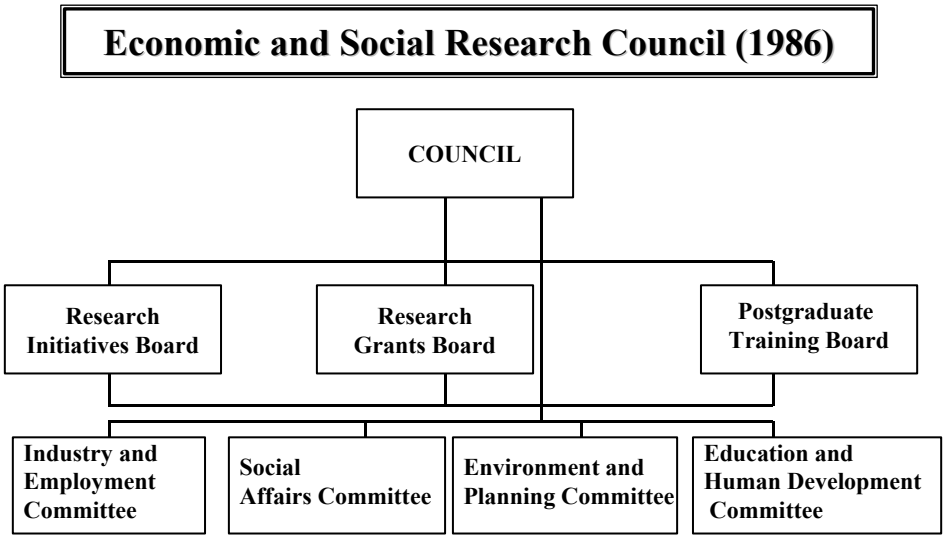
Figure 1



These discipline committees transacted the large majority of SSRC business. They reviewed all Grant applications and allocated Masters and Ph.D studentships. Only one disciplinary Committee saw the majority of Grant applications. The Council had two subsidiary Boards, one of which allocated studentships to the Committees and the other checked the decision made on Grants for comparability of standards, and adjudicated between Grant applications which had been reviewed by more than one Committee. While this system continued, there was a widespread belief that multi-disciplinary applications which were seen by more than one Committee were outsiders and had less chance of success.

The Council introduced a Research Initiatives Board in the middle of the 1970s, thus launching a balance of responsive and pro-active research funding which continues today, although the balance has changed over time. The discipline committee core of the Council's work continued until the newly elected Thatcher Government set up a hostile review of the Council in 1981. The Report of the Committee chaired by Lord Rothschild recommended in favour of the Council, (HMSO, 1982) to the dismay of many Conservative Cabinet Ministers. The then Secretary of State for Education and Science, Keith Joseph, was particularly disappointed but was obliged to accept the Report. He nevertheless slashed the Council's postgraduate training budget and insisted on the change of name to the present Economic and Social Research Council, asserting that the social sciences should not claim to be "science". In the aftermath of these bruising battles, the Council's Chairman pushed through internal changes which replaced the discipline Committees with a smaller number of area committees, Economic Affairs Industry and Employment, Social Affairs, Education and Human Development, Environment and Planning, Government and Law. By this time the discipline footprint in the new ESRC was still visible but it was much less clear.

Figure 2

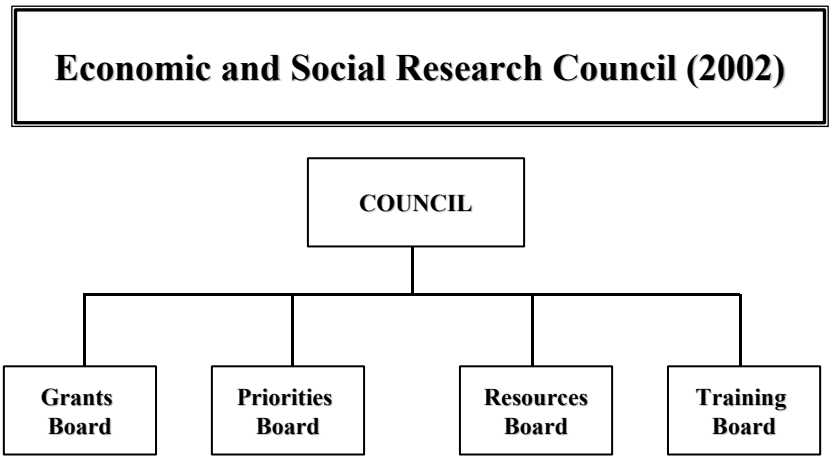


The new Committees retained a range of delegated authorities over Grants, pro-active "initiatives" and postgraduate work. However the role of the Council's three higher level non-disciplinary Boards was growing stronger, as pressure increased on ESRC to deliver results within Conservative governance and political attitudes.

In 1989, the Council moved to Swindon under a new leader, Professor Howard Newby. By now, there were large tensions between the different decision making levels. Below the Council and its Boards, the area Committees had become "Research Development Groups", limited to developing and funding research initiatives. Responsibilities were shared across the levels and became blurred. They were the casualties of the reforms which followed. In 1992, Research Development Groups were abolished in favour of the intermediary Board tier. Grants and (postgraduate) Training were retained and new Boards created with responsibilities for Research Centres, Research Programmes and Research Resources.

The move away from discipline and subject was now complete. In 1996, further reorganisation replaced the Centres and Programmes Boards with a Board tasked with all of ESRC's proactive, Priority research. This simple structure of Council and four spending Boards remains in place in 2002.

Figure 3



From the start, the Council's Priorities Board took a positive stand on what it termed “interdisciplinarity”. Its Calls for Centre applications and Programme project awards now routinely stress that applications which work across discipline boundaries will be welcomed, and are in some cases necessary, as these quotes from recent Calls show:

> *"Research programmes are… multi-disciplinary in nature.”*
>
> *(extract from the 2001 Science in Society Programme Call)*

> *“… a major multi-disciplinary Research Programme - the programme will be structured in thematic workshops and network to foster multi-disciplinary exchange…”*
>
> *(extract from 2002 Cultures of Consumption Programme Call)*

In another example, research on the economy is not left only to discipline of economics:

> *"In the past… these issues have been largely the preserve of economists… a better understanding of them (now) requires new tools and a broader perspective involving other disciplines… this programme…. provides scope for more cross-disciplinary work.”*
>
> *(extract from the2000 Macro Economy Programme Call)*

By 1996, the ESRC had also adopted a policy framework of multi-disciplinary Themes. These Themes are now a hallmark of ESRC and are used by the Council to shape future activity. Other evidence of scale of work which crosses the disciplines can be found in the 31% of Grant applications to ESRC in 2001/02 in which the applicants themselves indicate that there is more than one contributory discipline within their application. Last but not least, all new ESRC Centres and Programmes have genuine contributions from several disciplines, sometimes also from outside the social sciences.

These moves within ESRC towards support for work across disciplinary boundaries have now been given further momentum by the "Quinquennial Review" (QQR) of the UK Research Councils, which reported in 2001 (DTI, 2001). The QQR identified nine future objectives for the Research Councils to pursue together, including:

"(vi) to initiate and support cross-disciplinary and multi-disciplinary initiatives " (DTI, 2001, p. 28)

It concluded that this cross-boundary work was sufficiently important to require that all the Councils' Charters should be amended to require joint working. These changes are now being made.

An Interdisciplinary Progress?

If institutional structures reflect organisational realities, then this has been a substantial and long-term shift away from the support of disciplinary research towards an interdisciplinary mode.

But this picture of interdisciplinary policy is neither complete, nor straightforward. Within ESRC, disciplinary differences remain very much in evidence underneath the multi-disciplinary structures. Members of three of the four ESRC Boards are still chosen according to "templates" based on a balance of disciplines – for example, one or two economists, one or two sociologists and so on. The representative academic institutions with whom the Council needs to work are almost all discipline based. The large number of applications which reference more than one discipline may be more the result of perceptions of ESRC requirements than of research plans which genuinely cross the discipline boundaries.

The interventions in these systems of a funding agency like ESRC may therefore be less significant then they appear from a distance. This hypothesis has had some support recently from a study which the Council's Research Priorities Board (RPB) recently commissioned. A review of RPB support for interdisciplinary research was carried out by Joyce Tait and Catherine Lyall of the University of Edinburgh. They found that intentions and outcomes were not fully matched. They concluded that "the main barriers to interdisciplinary research were seen to lie in the Universities themselves and with the Research Assessment Exercise (RAE)." As far as the ESRC policies were concerned they found no evidence of ESRC practices inhibiting interdisciplinary application (and) funding, but were critical of weak signals "which did not reach into the real intentions of the researchers" and of what they called slow and faltering progress within the Research Council's policies and practices. (Tait and Lyall, 2001)

These conclusions remind us that social science research does not happen within ESRC, but within the institutional and cognitive environment of universities and research institutes, in "the academy." There are many barriers to working across disciplines within the institutions of the academy (SURPC, 1997). Disciplinary institutions remain strong. Discipline based Departments (or similar) are the norm in Universities rather than the exception.

These disciplinary arrangements are visibly supported (some would say encouraged) by the Higher Education Funding Councils' Research Assessment Exercise (RAE). This is the mechanism which determines the allocation of the research element of the first level, baseline funding to British Universities – £867million in total in 2001/02.

The "Units of Assessment" (UoAs) on which the RAE is based are almost all constructed on the basis of disciplines or disciplinary sub-fields (e.g. Psychology, Sociology, Political Science, Anthropology, History). Each Researcher who is assessed within the RAE is required to report on published output to the discipline or field Panel which is reviewing that Unit, though reference across to another Unit can be requested.

It is not surprising that the RAE is perceived by many researchers and policy makers to be a barrier to research across discipline boundaries. A study commissioned by the Funding Councils found strong criticism of the impact of the RAE on interdisciplinary research. Almost a quarter (24%) of researchers and 17% of the members of the RAE UoA Panels believed that the RAE "strongly inhibits interdisciplinary research, with the strongest criticism coming in the social sciences, arts and humanities, and from those most heavily

involved in interdisciplinary work. To put those figures in context, only 6% of researchers and Panel members thought the RAE strongly promoted interdisciplinarity. (Evaluation Associates, 1999).

There are also cognitive as well as institutional barriers within the academy. Disciplines have their own cognitive structures, assumptions and rules of the game. These have their important functions but continue to inhibit connection, interaction and the interdependence foreseen by Heyworth (op cit) in the 1960s. . These issues are visible every day in academic life. They are particularly serious when social scientists and natural scientists try to work together, as Howard Newby pointed out when discussing environmental research, co-operation between social scientists and natural scientists requires mutual understanding of differing epistemologies and theories (Newby, 1994).

The barriers within the social sciences have been thoroughly discussed elsewhere (Bauer, 1990; Blume, 1990; Boudon, 1999; Whitley, 1984) and do not need rehearsing in detail here, except to note that this is not an issue special only to the UK.

The long-term international persistence of disciplinary boundaries in the social sciences, and the need to work across them, was the subject of the 1995 "Open the Social Sciences" Report from the Gulbenkian Foundation. The Report concluded that disciplinary boundaries were very much in evidence, positively harmful to the ambitions of social science to address the large questions. The solutions were intellectual rather than institutional:

> *"What seems to be called for is less the attempt to transform organisational frontiers than to amplify the organisation of intellectual activity without attention to current disciplinary boundaries".*
>
> *(Gulbenkian Foundation, 1996)*

Thus interdisciplinary research is practised in the face of large and continuing intellectual and institutional challenges. It often remains marginal, especially if it seeks to move beyond multi-disciplinary conversation and co-operation (c.f. Rayner, elsewhere in this volume). This is a more complicated story than the steady advance towards a Mode 2 future without disciplines (Gibbons et al, 1994) which the history of UK ESRC structures might at first sight suggest.

Drivers and reactions

This brief history has revealed large changes in decision-making structures within a national funding agency. The Research Council appears to have come to see discipline-based structures as too narrow and limiting. New structures have been created which give priority to co-operation across those boundaries.

There have been several important drivers of these changes. External policy makers have become impatient with the limitations which discipline boundaries seem to place on the creation of new knowledge. (Blume, op cit). This policy pull has grown much stronger within the UK in the last twenty years and has reached new levels in the UK with the emphasis placed on "evidence for policy" by the current Labour Government. (Solesbury, 2001). Together with the moves within all the UK Research Councils towards "meeting the needs of the users of research and training output" (HMSO, 1993) this is research policy driven by the social context of application (Gibbons et.al, 1994).

An associated driver for change has been the increasing tendency of the Council's internal leadership to be impatient with the rigidities of a discipline or subject committee structure. At the time of the 1981-82 crisis, the disciplines and their representatives were seen as hindering rather than helping a collective organisational response to external pressure. The Council's leaders came to believe that this structure put the organisation further at risk because of the negative perceptions within influential policy communities

(such as potentially sympathetic Government Departments, who were often looking for much more broadly based advice). In the less cataclysmic decades since then, the Council has managed to improve its position and its budget. This has almost always been achieved through proposals for new multi-disciplinary problem-oriented research, and these lessons have been learnt and translated into internal organisational change.

Over the same period, there have been drivers for change within academic social science. Boudon (op.cit.) has argued that shared interest in rationality is driving convergence between several previously divergent social sciences. Use of common techniques, methods, models and technologies also seems to be encouraging new forms of convergence.

However there are also some very influential centrifugal forces within the existing disciplines, such as the post-modern challenge to quantification and the development of increasingly specialised techniques within disciplines such as psychology and economics. There have also been strong academic reactions against what has often been seen as excessive central direction and attention to policy needs. In these circumstances, reactions have often been expressed in terms of disciplinary needs and values.

The story of policy in support of interdisciplinarity is therefore not one of movement in one direction. Nor is it one continuously effective progress. Rather it is one where science policies are developed and implemented in interaction with internal and external organisational environments. By 2002, we find that a series of large and important structural changes in SSRC/ESRC have, over time, underpinned a move towards explicit encouragement of cross-disciplinary research. We can see also that these policies have had an effect, but that operate within a sphere of activity where they are contrary pressures.

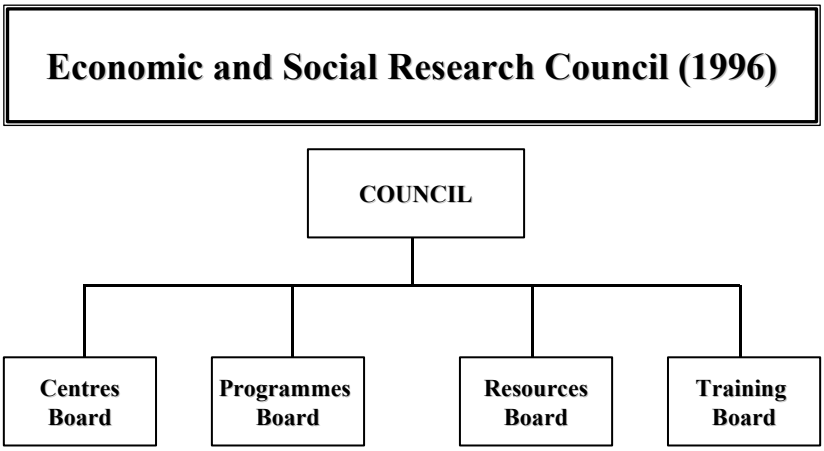
Starting on the Puzzle

We can already see that crossing the disciplines may be a simple concept (Ziman, op. cit.) but it is not a simple policy arena. Some tentative analysis and even more tentative explanation of the complexities can now be offered:

- Individual (social) scientists may be interested in a particular research approach. Funds may be available and policy encouragement provided. However there are often high cognitive barriers and opposing institutional pressures. Science policies such those supporting interdisciplinarity within the social sciences do not operate in a vacuum. Science policy decisions are implemented in organisational and cognitive locations where they interact with existing structures, interests and ideas.

- Policies in support of activities and processes like interdisciplinary research are part of larger processes of influence and agency. Research Councils, Science Ministries and other organisations which seek to promote policies of these kind are seeking to establish a kind of principal-agent relationship with the academic actors (organisations and individuals) to whom they are allocating funds. They are seeking both to have scientific research carried out on their behalf, and to influence the nature of that research. Principal-agent theory suggests that the academic beneficiaries will often seek to maximise their distance and autonomy from the funding principals, and to “shirk” their agency obligations – in this case, the principal’s pressure for interdisciplinary work. The position of Research Councils is further complicated by their intermediary role, whereby they act as agents for Ministries, whilst acting also as principals in the commissioning of research from the academy. (Braun, 1993).

Figure 4



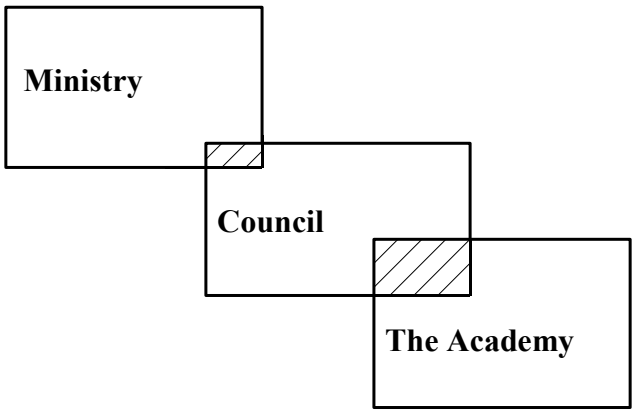
Coleman's classic statement on principal-agent (Coleman, 1990) was not written with reference to science policy, but it makes the principal-agent element in science policy crystal clear:

> *"This class of social transactions is fundamental, for it provides a means by which interests can be pursued far beyond the capacities of the original interested party. It is not the only such means but it is frequently used when an actor with interests to pursue has a sufficient quantity of resources, but not those of the appropriate kind to realise the interests (for example, has money but not the appropriate skills). He may then wish to use those resources to provide a kind of extension of self."*

- The principal-agent model also helps us to understand the historical changes in the SSRC/ESRC structures and processes between 1965 and 2002. The SSRC was set up in a climate of minimum Ministry intervention in the affairs of Research Councils (and of semi-detached agencies of this kind more generally). Conversely the shadow of the academy on the Council was initially dominant, rather contrary to Heyworth's advice (op.cit.,). The Braun model can be adapted to illustrate this.

Figure 5

A principal-agent view of SSRC in 1966

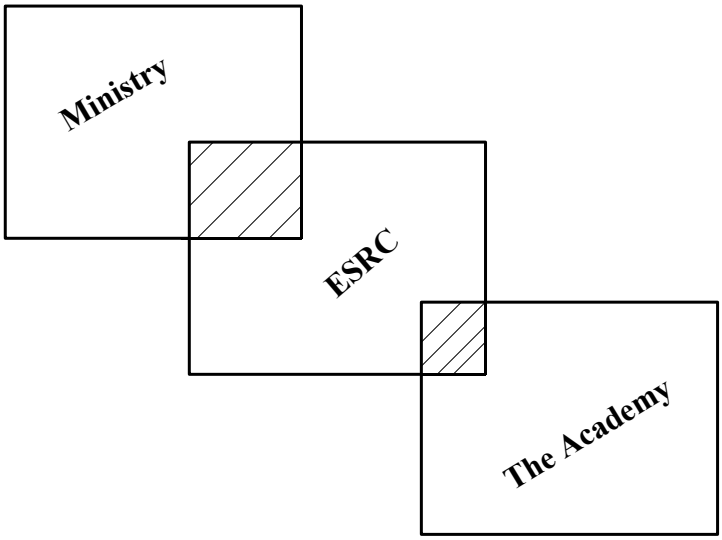


In this world, the academy's natural preference is for access to undirected research funds, and for internal structures which reflect its own. These preferences were very strongly expressed. There was little policy space left for the Council itself.

Over time the Ministry influence and shadow has increased. At the same time, the Council has worked within these shifting arrangements to increase its own policy space. The influence of the academy has declined. The outcome is a more purposeful organisation with a balance of influences, but with less high quality academic interaction. It may be more able to define its own policies but is also seen by its prospective academic agents as too close to Government and too distant from them. Principal-agent relations are adjusted accordingly, with more tendencies to shirk and more moral hazard for the Research Council would-be principal (Guston, 1996).

Figure 6

A principal-agent view of ESRC in 2002



- There are differing views amongst scientists and science policy actors about the salience of interdisciplinarity and the extent to which research across disciplinary boundaries is increasing. It is important to understand these differences when analysing the discourse about the issue (for example, when thinking about the Ziman puzzle). A simplified model can be drawn up which identifies four types of attitude and preference, on the dimensions of optimism and pessimism about the value of interdisciplinarity, and more or less likelihood of significant moves in that direction (e.g. in the social sciences):

Figure 7

Expectations of change to I-D

Views about I-D	+	-
+	**Mode 2**	**Intervention** **- RCs** **- Others**
-	**Opposition to Intervention**	**Ignore the fuss**

This helps us to understand that those who promote science policies in support of interdisciplinarity are inherently optimistic about its value but pessimistic about it's the chance that it will be achieved without external interventions in the science(s). The strongest interventions will come from those who doubt its value and see discipline boundaries as being under threat.

It also reminds us that science policy issues are debated by actors with differing interests and expectations.

Conclusions

As far as the social sciences are concerned, the puzzling paradoxes of the quest for interdisciplinarity can now be seen in some new light. The apparently simple question of why a desirable objective like interdisciplinarity is not achieved can be unpacked into discussion of tensions about the nature of social science and scientific knowledge, about the structural place and importance of disciplines in academic institutions, and about the ability of Research Councils as institutions to influence the nature and direction to research.

Interdisciplinarity becomes then an important science policy case study, usefully analysed in these wider terms, and located within a history of epistemological and political change. This has been only the story of one-policy issues, one organisation and one country but same tentative suggestions can nevertheless be offered.

Firstly, the view back over nearly 40 years draws attention to the persistence of interdisciplinarity as a science policy issue, at least in the social sciences. Heyworth's interest in it reminds us also that knowledge users as well as knowledge producers have for a long time been impatient with the constraints imposed by strongly institutionalised disciplines on the production of new and potentially useful knowledge.

This small history also draws attention to the importance of organisational structure. At the same time, the cautionary tales about the situation today are evidence that internal analysis of science policy organisations, whether of structure, or policies or actors, will not provide sufficient explanation. That can only be attempted by examination of the interaction of science policy organisations and initiatives with the science they seek to influence.

It must be acknowledged at this point that there are many other ways this story could be told. It could be supported – or challenged – by careful analysis of flux within the social sciences. The disciplines themselves have undergone many changes. Methods and theories are used more eclectically, providing new bases for interdisciplinary work. It is the internal scientific forces which are often emphasised by scientists in the debates, on interdisciplinarity, anxious perhaps to be free of any suggestions of ageing dependence on some unwanted policy principal. (Examples can be found in many of the contributions to the 1997 Academia Europaea Conference, Cunningham, 1999).

This leads on to the methodological observation that the historical perspective can provide useful additional insights into science policy institutions, processes and outcomes. Similarly, science policy is inevitably concerned with power, influence and interests and principal-agent theory offers one way of integrating their study into an improved understanding of thus policy arena.

Lastly this paper has drawn attention to the different perspectives which may be brought to bear on the interdisciplinarity debate. Science policy debates are influenced not only by institutional and intellectual history but also by the "present day purpose and inspiration" which Richard Evans has identified as a generic and legitimate element in all historical analysis. (Evans, 1997). Following Evans, we should aspire to a systematic, reflective and optimally objective study – in this case of interdisciplinarity across the sciences.

Although it could only begin to explore the potential, this paper has tried to illustrate the value of a mix of political, historical, cognitive, organisational and institutional concepts and methods. The solution to the Ziman puzzle about why interdisciplinary research is so hard to deliver may lie in a truly interdisciplinary study.

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Deutsche Forschungsgemeinschaft (DFG – The German Research Council): Structural Provisions for Interdisciplinarity (and some observations on them)

Manfred Niessen
Director of the Division for Humanities and Social sciences in the German Research Council

General Aspects

DFG is an autonomous organization within the German scientific community. Legally a private association under civil law, its members are universities established as research institutions, research institutions like the Max-Planck-Gesellschaft, the Academies of Science, and a number of major research institutes (national laboratories) and scientific associations. The heads of these institutional members (General Assembly) elect the President, the Board of Vice-Presidents and the academic members of the central bodies established for the conduct of business (Senate, Grants Committee). While there is no formal individual membership in DFG, all researchers who have held a Ph.D. degree for three years or more and work in academic institutions have active and passive voting rights for DFG's elected peer review committees which form the backbone of its evaluation system.

DFG uses peer review on all project grant applications. While mail review is commonly used for individual grants, panel review, often including site visits, is common for all forms of cooperative research. All reviewers work on an honorary basis; there are no fees. The backbone of the DFG's peer review system are the elected review committees.

Special reviewers, both from Germany and increasingly from abroad, are often consulted for all panel reviews and for many mail reviews where their expertise is needed to evaluate individual projects. Peer review is confidential and anonymous. The DFG office operates a conflict of interest policy for all peer reviews.

Modalities of Funding

There are different modalities of funding with different implications for interdisciplinarity:

Individual grants: The individual grants scheme traditionally forms the nucleus of DFG's activity. Some 40% of its total funding is devoted to this modality. Any academic scholar may propose a research project of his/her choice in this scheme at any time.

Research Groups: Funded within the individual grants scheme, Research Groups are designed to give a limited number of highly qualified researchers a medium-term planning perspective (6-8 years) for cooperation in fields of high scientific promise.

For activities within the individual grants scheme and also for the Research Groups interdisciplinary cooperation is not requested or in any way imperative, but it is explicitly encouraged wherever suitable. Funding decisions are taken by the general grants committee.

Priority Programmes: Country-wide cooperation in selected fields is characteristic for the so-called Priority Programmes. On the basis of an annual open competition between proposals coming from the scientific community they are established by decision of the DFG Senate for periods up to six years.

Collaborative Research Centres: Supported with some 26% of total DFG funds, Collaborative Research Centres (Sonderforschungsbereiche) are a scheme of longer-term cooperative research in universities and neighbouring academic research institutions. Applications have to be formally filed by the universities.

Interdisciplinary cooperation is part of the “programme philosophy” of both the Collaborative Research Centres and the Priority Programmes and hence one of the selection and evaluation criteria. Funding decisions for the collaborative centres are taken by the centre grants committee.

All funding schemes with a mid- or longer-term planning perspective operate on the basis of mostly two- or three-year periods of peer-review-based money allocation – with the possibility of closing down programmes or centres not living-up to the expectations.

Aspects of Decision-Making

There are two aspects of DFG`s institutional set-up which should be inductive to inderdisciplinary cooperation and its funding:

a) DFG is an integrated research council for all disciplines – covering the natural and biological sciences, medicine, engineering, the humanities and the social sciences. The academic members of the decision making bodies – the Senate and the grants committees – represent the whole range of research activities. In their selection process they aim at applying comparable standards in dealing with highly divers research projects from all fields. The respect of special aspects of the disciplines is balanced against the necessity to apply rigorous standards of scientific quality.
b) The committees administer integrated budgets with no discipline-related breakdown.

As the decision making processes are integrated across disciplines both with regard to committee membership and budget there is no incentive to strengthen disciplinary boundaries, to turn down projects or to hand them over because they “do not belong ”. On the contrary, substantial parts of the funding modalities explicitly (priority programmes and collaborative research centres) and implicitly (research groups) ask for and encourage interdisciplinary cooperation.

Funding Schemes and Interdisciplinarity

Both out of General budget	Indiv. project proposals (including groups of projects)	Interdisciplinary cooperation is not requested but explicitly welcome
	Research Groups	
Own budget line for each of these two modalities, no discipline-related breakdown	Nation-wide priority programmes	Interdisciplinary cooperation is one of the selection and evaluation criteria
	Collaborative research centres	

Does it work? – Some ad-hoc observations

From the point of view of the institutional provisions within the research council everything seems to be prepared to induce and facilitate interdisciplinarity: There are no inter-committee or inter-agency boundaries,

no bases for implicit budgetary egotisms in the decision-making process on centres and programmes - and networking across disciplines is not only amongst DFG`s corporate priorities but also explicitly asked for in the philosophy of the funding schemes. But at the same time interdisciplinarity has always been regarded as a "problem" – from all perspectives: researchers find it difficult to get interdisciplinary initiatives successfully peer-reviewed; reviewers diagnose a lack of interdisciplinarity in initiatives that claim to be interdisciplinary; the grants committees wonder why researchers do not put more emphasis on interdisciplinarity and whether reviewers do properly acknowledge interdisplinary efforts … Why?

Far from addressing this question in any systematic way –and far from attempting to answer it – I offer some counter-intuitive ad-hoc observations on the relationship between modality of funding and ways of interdisciplinary cooperation. "Interdisciplinary Cooperation" may encompass a whole range of activities , e.g. the following :

Forms of Interdisciplinary Cooperation

- taking notice of each other
- mutual assistance
- common terminology
- theoretical and/or methodological "added-value" while the basic categories and concepts remain disciplin-related
- integrated theoretical approach

These forms may designate levels of "development" of interdisciplinary cooperation - from "low" (taking notice of each other) to "high" (integrated theoretical approach). One might assume that the degree of development is positively correlated with the programmatic impetus on interdisciplinarity of the various funding schemes. On the basis of personal and purely ad-hoc observations I would, however, come to the opposite conclusion, namely a negative relationship between programmatic impetus on and actually realized degree of interdisciplinarity:

Whereas interdisciplinarity is in no way a "must" in individual projects it is on this level that boundary-crossing forms of cooperation can often be found – within a project or in self-organized groupings of two or more projects, where the researchers team together according to the needs of the topic which is being studied. On the other hand, both the nation-wide Priority Programme and the Research Centre schemes emphasize interdisciplinarity as a selection and evaluation criterion. Consequently, many individual priority programme initiatives and center proposals bring together projects from various disciplines. However, interaction between these projects is not always developed beyond the rudimentary form of taking notice of each other.

Why do programmatic impetus on and actual degree of realization of interdisciplinarity seem to be negatively related? The programmatic impetus is strongest in the large scale schemes, nation-wide priority programmes and collaborative research centres, i.e. it is positively correlated with the size of the unit of funding. Size of the unit of funding, however, is in all likelihood positively correlated with

- heterogeneity in terms of number of disciplines, methodological approaches etc.
- organizational demands and
- extrinsic motivation to participate (institutional pressure, external drivers etc.) as opposed to intrinsic motivation (research driven interest).

(There is another factor independent from size of unit and programmatic impetus. It seems that paradigm-orientation, i.e. theory- or model-driven projects, programmes and centres, is less favorable to interdisciplinarity than problem-orientation.)

My personal conclusion is that interdisciplinarity is more likely to be “realized” in a mature form in smaller units which follow the research-driven interests of the researchers themselves. However, it is less likely to be perceived by research policy in these smaller units as they are not programmatically labeled as being “interdisciplinary” in nature.

This programme-biased perspective of research policy and research institutions has a double consequence: It does not bring into focus the whole range of sometimes intensely interdisciplinary individual projects, small groupings of researchers etc., thus painting a picture less favorable than necessary. And it stands in the way of identifying and implementing measures geared at soliciting interdisciplinary cooperation in larger programmes and centres which goes beyond the superficial level of just gathering different disciplines under a common umbrella.

Postscriptum

Recently DFG has set-up a line of activities to actively give orientation towards and training for interdisciplinarity in its larger programmes and centres. Workshops and seminars are offered to researchers who have initiated such programmes or centres and who coordinate their activities. This line of activity, which now is open to all fields, has grown out of a social science nation wide priority programme on environmental change, which brought together researchers from six highly diverse disciplines. The obstacles in the way of joint interdisciplinary activities, being felt in particular by the young research students, were the starting point for developing in a professional way a series of training seminars and workshops.

The Design and Delivery of Inter- and Pluri- disciplinary Research: The case of European energy RTD

Domenico Rossetti di Valdalbero and Benat Bilbao Osorio
European Commission, DG Research (Energy programme)

More inter- and pluri-disciplinary research in the 6th Framework Programme

Research and Innovation is widely accepted to be a central component of the new economy and the knowledge-based society. It is believed to be now, more than ever before, one of the basic driving forces behind economic and social progress as well as a key factor in business competitiveness, employment and quality of life.

The new challenges facing European research require a stronger co-ordination among stakeholders and a inter- and pluri-disciplinary effort in order to foster a competitive and sustainable development.
Within this framework, the European Commission proposed the creation of the *European Research Area*[1] (ERA). ERA aims to an open co-ordination with the different national programmes and other European organisations, creating a more comprehensive European research policy. The 6th Framework Programme of the European Community for research, technological development and demonstration activities 2002-2006 (FP6)[2] will be the key tool for supporting the ERA.

FP6 represents a deliberate break with the past FPs with regards to its ambition, scope and instruments to be used in its implementation. It adopts a *new philosophy*, aimed at achieving a greater focus on questions of European importance and a better integration of research efforts, on the basis of an improved partnership between the various actors in ERA.

The new FP6 philosophy can be summarised in the following principles for which inter- and pluri-disciplinary research and integrated approach are the key drivers:

- EU resources will be *concentrated* on limited number of priorities in order to achieve a minimum threshold of resources, fostering better and significant results. These priorities will need to benefit from the natural and human sciences covering basic, applied, demonstrative and socio-economic research.

- A large number of research teams coming from different disciplines will be set up. These groups will be *networked* and will provide different visions and complementary approaches in order to tackle problems from different angles and obtain comprehensive solutions.

- The new approach aims at providing genuine *European added value* so that the research which is carried out has a significant impact in the whole European Union.

- FP6 will have a structuring effect *linking policies and schemes* on national and regional authorities and other European actors. It will also co-ordinate research policies from different agents and institutions from different backgrounds and disciplines within and among the Member States.

1 COM(2000)6 and COM(2000)612.
2 COM(2002)43.

- The use of *new instruments* will allow and foster the development of inter- and pluri-disciplinary teams:

  → **Integrated Projects (IP)** are designed to give increased impetus to the Community's competitiveness or to address major societal needs by mobilising a critical mass of research and technological development resources and competence from different backgrounds.

  → The purpose of **Networks of Excellence (NoE)** is to strengthen and develop Community scientific and technological excellence by means of the integration, at European level, of research capacities currently existing or emerging at both national and regional level. Each network will also aim at advancing knowledge in a particular area by assembling a critical mass of expertise. They will foster co-operation between capacities of excellence in universities, research centres, enterprises, including SMEs, and science and technology organisations.

- The need to *consult all the involved stakeholders* and to allow them to bring in their contributions, coming from different perspectives and views is regarded as basic. In this line, consultations with the industry (i.e. Eurelectric, EWEA, etc. for the case of Energy Research), NGO (i.e. Greenpeace, Globe, etc.), Universities and Research Centres is strongly encouraged.

- Research activities will take into consideration the relevance of the different *EU policies*. Energy research, for example, will have to jointly tackle the issues of energy security of supply[3] and environment sustainability[4]. The EU commitment to reduce greenhouse gases emissions by 8% in 2008-2012 in confront to 1990 under the Kyoto protocol[5] or to double the use of renewable energy[6] sources up to 12% of the overall energy consumption by 2010 are essential aspects that Energy research should take into account.

Taking care at the evaluation of the inter- and pluri-disciplinary research

In order to secure that inter- and pluri-disciplinarity is taken into account, the evaluation process of the research proposals submitted to the European Commission in the 5th RTD Framework Programme (1998-2002) took into consideration the two following main dimensions:

1. Scientific and technological excellence and management resources of the project

The scientific and technological quality of the project proposal is regarded as a key element to guarantee the achievement of the stated objectives. Equally, the innovative elements which are included in the proposal are born in mind. Quantified objectives to achieve at the end of the project helps the external evaluators in their tasks and the European Commission to check the progresses of the project.

Closely related to these aspects, one finds the level of the management skills, the resources, which will be devoted to the project and the quality of the partnership, which is being set-up. All these aspects do also contribute to the future success of the proposal.

[3] COM(2000)769.
[4] COM(2001)31.
[5] COM(2000)87 and COM (2000)88.
[6] OJEC L 283.

2. Socio-economic aspects of the project

At the same time, the evaluation process does also consider other aspects which are not technical ability to achieve the goals stated, but which deal more with the possible impact the projects may have in different areas of the EU society or economy. In particular, some specific elements, which are analysed, are:

– *Community added-value and contribution to EU policies:* European Commission financial contribution searches in the proposals that the outcomes benefit the overall community objectives, providing a significant contribution to the different EU policies (for e.g. competitiveness, environment,…). Equally, it is intended that the proposals benefit an extended inter- and pluri-disciplinary audience by providing a true Community added-value, through achieving a critical mass in human and financial terms coming from different Member States.
– *Contribution to Community social objectives:* Research projects are also assessed according to their capacity to improve the overall employment situation, promote the quality of life and health or preserve the environment.
– *Economic development and scientific and technological prospects:* Projects are also evaluated in terms of the growth perspectives they provide to the overall economy, to the enhancement of economic competitiveness and the potential for dissemination and exploitation of the results they aim at.

All these criteria are born in mind when external experts (coming from different countries, backgrounds and disciplines) evaluate different proposals. Certainly, their relative importance is also considered and thus, a weighting factor is also included in the overall process.

As we can see, many variables from different fields and domains and many stakeholders are taken into account in order to guarantee that the results of the investment efforts coming from the Community funds are maximising their efficiency.

Inter- and pluri-disciplinarity in Energy RTD: the evaluation of external costs

The ten years ExternE project ("External costs of Energy")[7] has certainly played an important role not only in terms of "European awareness" about the possibility to quantify – and therefore to internalise - external costs but particularly to provide a coherent and complete accounting framework for European Union external costs for electricity and, partially, for transport sectors. The inter- and pluri-disciplinary team of researchers (environmental scientists, energy specialists, health and ecology experts, atmospheric modellers, economists, etc.) has furnished a common scientifically agreed methodology and held sufficient case studies in order to launch the debate about the real internalisation of external costs. The main strength of ExternE should be seen in the feasibility to scientifically tackle such kind of issue and to help decision-makers willing to implement measures aiming at reducing socio-environmental damages.

The scope of the ExternE Project has been to value the external costs, i.e. the major impacts coming from the production and consumption of energy-related activities such as fuel cycles. An external cost, also known as an externality, arises when the social or economic activities of one group of persons have an impact on another group and when that impact is not fully accounted, or compensated for, by the first group.

The impact pathway approach - and coming along with this approach, the EcoSense model, an integrated software tool for environmental impact pathway assessment - was developed within the ExternE project and represents its core. Impact pathway assessment is a bottom-up-approach in which environmental benefits and costs are estimated by following the pathway from source emissions via quality changes of air, soil and water to physical impacts, before being expressed in monetary benefits and costs. The use of such a

[7] Eurelectric, Pricing the environment? An update on ExternE, Proceedings, Brussels, 2001.
ExternE: Externalities of Energy, Vol. 7-10, European Commission, DG Research, OPEC, Luxembourg, 1999.

detailed bottom-up methodology – in contrast to earlier top-down approaches – is necessary, as external costs are highly site-dependent and as marginal (and not average) costs have to be calculated.

Two emission scenarios are needed for each calculation, one reference scenario and one case scenario. The background concentration of pollutants in the reference scenario is a significant factor for pollutants with non-linear chemistry or non-linear dose-response functions. The estimated difference in the simulated air quality situation between the case and the reference situation is combined with exposure response functions to derive differences in physical impacts on public health, crops and building material. It is important to note, that not only local damages have to be considered – air pollutants are transformed and transported and cause considerable damage hundreds of kilometres away form the source. So local and European wide modelling is required.

As a next step within the pathway approach, exposure-response models are used to derive physical impacts on the basis of these receptor data and concentration levels of air pollutants. The exposure-response models have been compiled and critically reviewed in ExternE by expert groups.

In the last step of the pathway approach, the physical impacts are evaluated in monetary terms. According to welfare theory, damages represent welfare losses for individuals. For some of the impacts (crops and materials), market prices can be used to evaluate the damages. However, for non-market goods (especially damages to human health), evaluation is only possible on the basis of the willingness-to-pay or willingness-to-accept approach that is based on individual preferences. The monetary values recommended in ExternE by the economic expert group have been derived on the basis of informal meta-analysis (in the case of mortality values) and most recent robust estimates.

There are several ways of taking account of the cost to the environment and health, i.e. for “internalising” external costs. One possibility would be via eco-taxes, i.e. by taxing damaging fuels and technologies according to the external costs caused. For example, if the external cost of producing electricity from coal were to be factored into electricity bills, between 2 and 7 cents per kWh would have to be added to the current price of electricity in the majority of EU Member States. Another solution would be to encourage or subsidise cleaner technologies thus avoiding socio-environmental costs. The Community guidelines on state aid for environmental protection explicitly foresee that option[8].

Conclusion

The conduction of inter- and pluri-disciplinary research is recognised and aimed at the Community level. The set-up of the evaluation processes reflects this need and it is the mechanism the Community counts on, to implement the required inter- and pluri-disciplinarity.

The new framework programme (FP6) will enhance the creation and consolidation of inter- and pluri-disciplinary teams, working on integrated solutions, which take into account technical and socio-economic aspects, coming from a wide range of stakeholders.

In the field of Energy Research, there are several examples, where the importance of inter- and pluri-disciplinarity has been identified and consequently a holistic approach has been implemented.

[8] OJEC, C 37.

Chapter 4: Specific cross-disciplinary programs

The second group of proceedings consists of descriptions of specific cross-disciplinary programs. Important issues in this chapter are the use of instruments, the variety in structures and the management experiences presented.

ESRC Future Governance Programme

Edward C Page
Professor LSE; Director of the ESRC Future Governance Program

I must confess to being daunted by the theoretical aspirations of the Muscipoli group: no less than to make use of relevant theory through the preparation of a series of questions about the roles of principals in policy making, the extent of agency, the variety of actors, and the networks in which the various organisational actors are seen to operate.

I was wondering how I could possibly make a contribution to this, not least because I am an agent in this model as of an ESRC programme. After reading up quite a bit on principal-agent theory I decided that I had probably got the wrong end of the stick. As a political scientist interested in public administration and one who spends much of his research time interviewing civil servants I realised that what was going on here is that the boot is on the other foot -- I am the object of research. So I will spare you my take on transaction costs and principal-agent theory and give you the facts. The purpose of this short talk is to tell you about the UK Economic and Social Research Council's (ESRC) Future Governance Programme. I will take it in five main stages. First I will outline what a programme is in the ESRC context, I will then describe the Programme briefly and in the third section I will point out the role of the director and in the fourth outline how the crossdisciplinarity is handled. In the final part I will make a few comments about the work of an ESRC programme director from a rather personal perspective which may be of interest to your theoretical concerns.

ESRC and research programmes

ESRC funds research projects broadly in two ways. First, through "responsive mode". This means a researcher or researchers puts in a grant proposal, this is evaluated for its intellectual merits, methodology and so on through peer review and the research proposal is either accepted or rejected. While ESRC offers general help in terms of administering the grant and disseminating the results, the research is essentially stand-alone.

Programmes are the second way a researcher can gain funding for his or her project. ESRC develops broad initiatives which are then made the responsibility of a team given the task of, among other things, attracting proposals for grants in that area, selecting proposals, developing programme-wide activities across all projects and drawing general conclusions from the projects taken as a whole once the programme draws to an end.

The themes of programmes include: Understanding the Evolving Macro-Economy, Cities: Competitiveness and Cohesion, Sustainable Technologies, One Europe or Several? Democracy and Participation, Devolution and Constitutional Change, Teaching and Learning, E-Society, Eating, Food and Health, Growing Older: Extending Quality Life and Violence. An average programme will have around 20 or 30 individual projects, some have more some fewer. Some programmes commission research in two waves or rounds (thus identifying and addressing gaps after the first round) others just have the one.

A programme will start life as the bare bones of an idea. ESRC raises several such ideas for programmes each year. Each idea has to pass through the deliberative processes of the ESRC. Then an academic is commissioned to flesh out this idea (which is presented typically a paragraph or two outlining it in general terms) to a fully-fledged proposal. In doing so the academic usually consults as widely as possible among those in disciplines likely to be interested in it. It then is in competition with other proposals for the scarce funds available to fund programmes and is evaluated by the ESRC once again.

The Future Governance Programme

The central concern of the Future Governance Programme is how to use comparative public policy analysis to help improve public policy. Governments increasingly seek to adapt ideas and practices developed outside their jurisdictions to address domestic public policy problems. This process of policy learning takes a variety of forms. In some cases it is voluntary, as politicians and government officials look to the experience of other countries for alternative ways of dealing with problems; in other cases it results from outside incentives, such as through international aid packages. Policies may also be adopted almost compulsorily, such as with international treaty obligations. The agents of transfer might be international organizations, think tanks, firms, academics, politicians or government officials. Future Governance examines how lessons can be drawn, and have been drawn, from cross-national experience.

Bidding for research grants under the Programme was a two-stage process. 218 outline bids were submitted in December 1998, 53 were shortlisted and asked to submit longer proposals for the second stage in April 1999. In May 1999 the Commissioning Panel for the Programme decided to support 30 projects based on comments from over 200 referees -- academics and practitioners -- from Britain and other countries. The Programme was formally launched in June 2000 with speeches from Lord Falconer, the Cabinet Office Minister, Lord Williamson, who chairs the Programme Advisory Committee and Prof Willie Paterson, who chaired the Commissioning Panel.

The projects examine different aspects of lesson drawing, reflected in the three themes of the Programme (most programmes are divided into at least three themes). *Theme A* draws lessons from policy initiatives and practices in different jurisdictions. Projects under this heading look at the potential for innovation by cross-national learning in a variety of policy areas including taxation, housing, social insurance, prisons, performance measurement, fisheries management, environmental protection, conflict resolution and improving standards in public life. *Theme B* projects concentrate upon how policies work when they are adopted as a result of international treaties and obligations. Under this heading there are projects on European regional and social policies, money laundering, financial regulation, education, housing and public health in developing countries. *Theme C* projects look at the processes and mechanisms of policy transfer including the role of contractors for government ITC services, the UK reception of US law and order and workfare policies, how European nations learned from each other in utilities and telecommunications regulation, the diffusion of new public management approaches to public sector reform and the export of British higher education structures to continental Europe.

This central ambition is being pursued by a series of conferences and commissioned work which bring together academics and practitioners to examine the potential contribution of cross-national experience to developing public policy initiatives (outlined below). Overall the programme will allow us to answer key questions about the circumstances under which cross-national lessons are sought, the conditions under which policies can be transferred, how the process of transfer works and the political, social, economic and cultural variables that affect how lessons drawn from experiences in one jurisdiction can be applied in another.

Role of programme director

In programmes not everything is delegated to the director. The research council in Swindon above all still retains direct responsibility for scrutinising and administering research grants, ensuring their conditions are observed, ensuring fairness in the reviewing procedure for grant applications and administering the finances of the programme director. But much is delegated to the director.

As director of an ESRC programme there are three main phases of one's work. A *commissioning* stage that starts as soon as one is appointed and carries on until the research projects are under way, a *running* stage while the projects and the programme is in the middle of its life and a *winding down* stage. Since I only have direct experience of the first two, I will omit the third.

Programme directors are helped at each stage by an Advisory Committee (or in the first stage a Commissioning Panel). It is hard to overestimate the importance of an advisory committee. Given the range of academic disciplines involved in a research programme, and the number of potential stakeholders in a programme (interest groups, public officials and journalists above all), the perspective of with a wide range of experience and expertise is indispensable for the programme director. In addition to a formal annual meeting, contact with the Committee is continuous as their advice and agreement is sought for all major programme developments.

Commissioning

The central objective of this stage is to get the best quality research projects possible which address the programme themes and take the programme forward. Different programme directors do this in different ways.

In order to make sure that the Programme received as large a response as possible from researchers a short circular was sent to the research office of every UK university with a short summary of the aims of the programme (the draft specification for research proposals) and an approximate timetable for the call for papers in July 1998. In addition I paid several visits to individuals and universities in the period to October 1998 including Cardiff, Oxford, Birmingham, Loughborough, Lincoln, Sheffield and London.

The Commissioning Panel met in October 1998 to refine the specification for research proposals. The advertisement for outline submissions was published in national and educational newspapers in October with a deadline for first round submissions of December.

Once the call for papers went out I organised four regional meetings for those interested in submitting proposals in Glasgow, London (2 meetings), Manchester and Belfast. These meetings alone attracted 120 people. In addition, visits to Birmingham, London, Nottingham and Bradford brought direct contact with around 50 more. Interested researchers who could not attend the meetings phoned, faxed and emailed. A further six people visited me in my Hull base. During this time I responded to over 25 draft applications -- offering comments to anyone who wished to submit their ideas.

The Programme received 213 outline applications -- generally regarded as reflecting a high level of interest in a programme like this. The period from December 1998 to the Commissioning Panel meeting in late January 1999 was taken up with reading the proposals. The January meeting of the Panel shortlisted 53 proposals. In the three weeks following shortlisting I went and visited every single shortlisted applicant. This meant trips to Stirling, Edinburgh, Glasgow, Newcastle, Huddersfield, Manchester, Birmingham, Loughborough, Nottingham, Londonderry, Exeter, Portsmouth, Cardiff, Bath, Bristol, Liverpool, Brighton, Plymouth, Oxford as well as several trips to London. I responded to over a dozen draft applications (the offer

of reading through drafts was made to all shortlisted applicants), spoke to applicants on the telephone and responded to emails from them.

The final commissioning panel met in May 1999 and settled on 30 projects. ESRC in Swindon handled the financial negotiations with the projects. An ESRC director has a grant of his/her own to run the programme and this is negotiated between the ESRC and the programme director at the start of the programme. The administration of the grants remains an ESRC function – the director has no direct responsibility for this.

Running

Project-related issues tend to occupy some but not all the time of directors (whose employing institutions are compensated by ESRC for the fact that they work anywhere between 50 and 100 per cent of their time on running the programme rather than fulfilling their teaching and research contracts). These issues might be dealing with reporting procedures (projects have to produce annual reports for ESRC) or helping scholars gain access to research sources. Programme-wide meetings, at which all researchers in the programme get together to discuss issues of mutual interest, tend to take place around twice a year. A web page (http://www.futuregovernance.ac.uk) has to be set up and maintained, publications of working papers arranged. In the first year it is expected that programmes have a formal launch – a big reception and/or seminar to which policy makers, journalists and academics are invited as well as the researchers conducting projects under the programme.

In addition to project related issues, Future Governance runs *programme events.* All programmes have them, but Future Governance has more than most. The idea behind them is to bring academic research on comparative public policy issues to a practitioner audience. In 2001, for example, this involved

- **Collaboration with the Cabinet Office (1)**

There have been three joint seminars hosted in conjunction with the Centre for Management and Policy Studies attended by on average a dozen academics and a dozen senior civil servants. The first, in April 2001, held at the Cabinet Office had the title “What should a modern policy process look like?”; the second, in July 2001, held at the Centre for the Analysis of Risk and Regulation at the LSE looked at the European Union White Paper on Governance; the third, held at the Cabinet Office in November 2001, looked at “delivery”.

- **Collaboration with the Cabinet Office (2)**

A second strand to the collaboration with the Cabinet Office is in connection with the Civil Service College’s planned document advising civil servants on how to extract lessons from foreign experience. The CSC contacted me for advice and several researchers from the Programme attended the 2-day session at Sunningdale in September 2001. The launch of this document took place in March 2002.

- **Collaboration with the British Council**

The British Council has been eager for the Future Governance Programme to be involved with its international seminar series on “Modernizing Governance”. This involvement has not entailed any direct financial support from the Programme, although its role has been generously acknowledged. There have been two meetings. The first in Rome in March 2001 with the title “Modernising government in Europe: learning from international experience” attracted academics, public servants and business people from Italy, Germany, Sweden, France, Poland, the US, the European Union as well as the UK. The second, in Brussels in December 2001 was part of the British Council’s Governance week, and attracted a similar range of people to the first. Further meetings are envisaged as part of a 3-year seminar series “Modernising Government” including the next meeting on civil service skills in Poland.

- **Collaboration with the National Audit Office**

The National Audit Office approached me in connection with its work on improving policy making published in its November 2001 report “Modern Policy-Making: Ensuring Policies Deliver Value for Money”. The involvement of the Programme included initial planning recommending the academic used to write the report’s literature review (Brian Hogwood); convening a “focus group” of academics to brainstorm the issues in April 2001 and the programme director participating in the report Steering group.

- **Collaboration with political parties**

The Conservatives and the Liberal Democrats have responded to an approach to all three political parties (made with the approval of ESRC in Swindon) to arrange small seminars for party policy makers setting out lessons to be drawn from comparative public policy in an area of their choosing. This was initiated in November 2001 at a meeting with David Willetts MP. The first of such seminars came in January 2002.

- **A series of programme-sponsored meetings**
  - "The management of dangerous people with severe personality disorders: drawing policy and practice lessons from the United Kingdom the Netherlands and the United States" - a meeting to identify positive and negative lessons in this area of public policy which embraces risk assessment techniques treatment/control problems, legal parameters and human rights protection. A Future Governance Paper has already been produced and an edited book is under negotiation.

  - "How does crime policy travel?" International meeting held at Keele University with 20 academics from the UK, Italy and Australia. This meeting also involved researchers from the ESRC’s Violence research programme. A special issue of Criminal Justice based on this meeting is forthcoming.

  - “Changing the Law to Improve Women’s Representation in Politics: Lessons from Europe” held together with the Constitution Unit. Attended by 40 academics, civil servants, MPs and members of interest groups. A briefing paper based on this session was published by the Constitution Unit and sent to MPs, civil servants and leading members of interest groups and political parties.

  - "Reforming the UK's Top Courts" - Seminars held in London and Edinburgh (the latter run jointly with the ESRC Devolution Programme) together with contributions from the Canadian High Commission. Around sixty academics and lawyers attended this from Canada, Germany and the UK. A book is being negotiated.

  - Two Future Governance panels at San Francisco American Political Science Association meeting. Good audiences for both sessions helped generate US interest in the Programme.

  - "Benchmarking regional Policy in Europe" Conference, Strathclyde University brought together senior regional policymakers from seven Member States (Finland, France, Germany, Italy, the Netherlands, Sweden and the United Kingdom) and their counterparts from all ten CEE candidate countries. An occasional paper has already been produced and a book is in prospect.

  - Gender and the State meeting, Belfast. This meeting attracted 40 academics. At least one edited volume is in prospect. The additional payoff of our funding is that the European Science Foundation has now agreed to fund further meetings and work of the network. The organiser informs me that our initial small support was interpreted as ESRC interest and ESF was keen to take over.

- In addition individual projects run events which directors get involved in. Recent major projects events in the Future Governance Programme include

- "Comparative Experiences of Policy making in Countries in Transition" Londonderry. Attended by 50 academics and policy makers from Britain, Northern Ireland, Irish Republic, the USA and South Africa, including Nuala O'Loan, the Northern Ireland Police Ombudsman and Roelf Meyer from South Africa's Civil Society Initiative.

- "Accreditation of Higher Education: Comparative Policies in Europe" hosted by the Austrian Ministry of Education in Vienna. Around 60 educators and education administrators were there from Germany, Austria and central and eastern Europe. Papers were presented by researchers on the project as well as from colleagues in Italy and Belgium.

- Workshop "Researching Mass and Elite Attitudes towards the Seven Principles of Public Life" Oxford. A one-day workshop attended by academics and members of the Committee on Standards in Public Life including the Chairman.

- "Public Employment in International Comparison" Glasgow, bringing together members of the international team Both country papers and thematic papers were presented as draft chapters for a forthcoming book.

- "New responses to female offending" Conference attended by 101 people including 8 governors from the women's prisons, representatives from the Prison Service and Home Office, and speakers from Scotland, England, Canada and USA. The Conference was opened by Sir David Ramsbotham, Chief Inspector of Prisons for England and Wales and Mr Clive Fairweather, Chief Inspector of Prisons for Scotland. The papers from the Conference will be published by Willan Publishers in April 2002, with additional 3 additional essays by leading UK criminologists and a Preface by Sir David Ramsbotham.

- "Multi-Level Perspectives on the CFP in for EU and National policy makers". Conference participants included representatives from DEFRA and the Scottish Executive Rural Affairs Department, (SERAD), representatives from NGOs and local fisheries managers.

Interdisciplinarity

ESRC encourages collaborative and interdisciplinary work at all times. This programme was not conceived as distinctively interdisciplinary. There were expectations among colleagues, as I was to find out, that because this programme was about governance and I as director was a political scientist, that this would be a political science programme. In the early stages of the Programme, especially in commissioning, I was particularly concerned to make sure that the Programme was *no*t perceived exclusively as a political science programme. This meant talking to people outside political science to convince them of the breadth and openness of the Programme and find out what aspects of the draft specification seemed to put off researchers from other disciplines.

In the event we have had projects from a wide range of disciplines. Political science is the single most dominant discipline of the researchers involved, but just over one third of projects can be termed "political science". We have projects involving sociologists, geographers, social policy experts, criminologists as well as researchers in the field of public management, education and economics. We even have an exciting

project from the field of accountancy. As can be seen from the programme events, we have a wide range of social science sub-disciplines represented at the meetings arranged with policy makers and practitioners.

The approach to the research project selection as well as developing programme events has not been self-consciously interdisciplinary. We have always gone for the best quality research, wherever it comes from. For the most part the projects are run by single discipline teams. With the programme events we look for the most interesting research in the field that can be put in front of policy makers. These meetings tend to be more pluri-disciplinary.

Reflections on MUSCIPOLI theory: confessions of an agent

As I understand it, at the heart of the kind of principal/agent theory that is of interest to MUSCIPOLI, is the idea that uncertainty, complexity and risk are delegated to the agent by the principal. This is certainly true in the case of programmes. As a programme director one is signing away a large chunk of one's personal research career, usually five years, to run a programme. While I will return to the point later, lest anyone think I am complaining I will say that so far I can say that the advantages far outweigh any difficulties. But since the framework emphasises managing risk, complexity and uncertainty, let me start with the harder parts of the job.

What is delegated to the director and what risk is he or she taking? What would be regarded as a shortcoming in a programme to be laid, at least in part, at the director's door? The ESRC effectively delegates to directors the task of ensuring a lively response to calls for research proposals. The director is held responsible if the programme consists of the wrong balance of projects – whether this is too many or not enough from one discipline, whether there are big areas missed out or whether the research is unoriginal or does not produce the expected outcomes in terms of influence with policy makers, other academics (possibly in an international context) or academic books. The director is expected to provide *value added* – by his or her own work showing that the programme is more than the sum of its parts and that the investment in a programme has been more worthwhile than funding 30 individual projects.

Not all the performance indicators can be directly shaped by the director, and success in achieving programme goals are not entirely within his or her reach. Yet what are the risks run by directors in taking on a programme? It is possible for the ESRC to remove a programme director after a year if things are going disastrously wrong, but I have never heard of this nuclear option being used, so the effect of this possibility is unlikely to loom large in directors' calculations. Programmes are evaluated by lengthy evaluation procedures, a lighter review of the programme's annual reports and a full evaluation conducted after the programme has finished.

What happens if the programme is weighed in the balance and found wanting? There are no direct penalties to be incurred with possible future ESRC grants, which are awarded on the strength of the individual application (although incompetence in running a grant or failure to deliver on previous grants are, I understand, relevant considerations in subsequent grant allocations). So what does a director have to be afraid of? What makes the agent want to maximise the forms of output that the principal has delegated? While I can put forward no empirical evidence to back this up, let me offer some personal reflections on this.

I believe it is likely that professional standing is a key to understanding why directors put so much effort into running research programmes and making sure that they address the expectations ESRC has of its directors in terms of the major issues of quality, policy relevance, disciplinary balance and value added. To make a complete mess of a programme means that one has wasted five years of one's working life. An adverse evaluation is more serious as a reflection of loss of professional standing than as a black mark with ESRC (serious as that is in itself). To run a programme is a reasonably high profile job. Colleagues regard the total

pot of money in the programme as “your” money (even though you have no direct control over it save the director’s own grant). To waste it is to let down the profession, or the particular part of it you are deemed to come from. And the bigger they come the harder they fall – while a disappointing end to a small grant can, indeed if it is widely noticed at all, be redeemed by the next brilliant book or article, to have “wasted” the big money of an ESRC research programme is likely to take much longer to recover from. And professional standing among colleagues is important (via the refereeing process) for subsequent grant applications from a former director.

But the fear of failure is certainly not what keeps one going. Whatever the risks, and however much is delegated to you it is an extraordinary opportunity for an academic. In career terms it cannot be ignored that programme directors seem to end up in better positions (in pay and/or status) than when they started. On top of the chances it offers for the director to pursue the intellectual issues that interest him or her, it is an exciting opportunity to establish contact with academics in other branches of the social sciences, attend their meetings, learn to appreciate their theoretical and methodological standpoints and discuss issues of common interest. In addition it enables you to talk to consumers and potential consumers of social science research in government, political parties and other bodies. It is not an easy job, but I certainly would not pity anyone who had it. It is rewarding and fun.

In Defence of Disciplines:
Personal Reflections of an Interdisciplinary Scholar

Steve Rayner
Professor of Science in Society, Said Business School, Oxford University,
Director, ESRC Science in Society Programme

Abstract
A paradox is inherent in the idea that scholarly endeavour is or should be moving inexorably in the direction of universal interdisciplinarity. Drawing on two decades of personal experience, the author argues that interdisciplinary research depends on the existence of strong, but permeable disciplines and that interdisciplinarity is itself a specialized skill that thrives in specialized niches on the periphery of disciplines. To strengthen interdisciplinary capabilities for appropriate applications, funding agencies and scholarly institutions need to nurture these niches, rather than establish interdisciplinary standards for everyone.

An Introduction About Introductions
In meeting new people, whether professionally or socially, I am resigned to a moment of quiet panic when faced with one variant or another of the inevitable polite inquiry, “What do you do?” Once upon a time I could have responded with a straight face and some semblance of verisimilitude, “I am an anthropologist.” But that is only my discipline of origin. I retain my fellowship in anthropological professional associations out of sentiment and some sort of conviction that my personal history is important to my identity. But most members of those same learned societies would have great difficulty in recognizing me as one of their own.

Over the past two decades I have shed my disciplinary skin, dabbled in fields where, some might think, I have no right or authority to stray, to become something inexplicable in the verbal shorthand of polite conversation, where an appropriate response might be “I am an historian, a chemist, or, even, a plumber.” Instead, I find it almost impossible to resist the temptation to explain, even justify, my existence. “Well, I was an anthropologist of sorts, once upon a time. But I spent nearly two decades in science and engineering institutions, working with all sorts of people, physicists, engineers, lawyers and economists and trying to advise policy makers. Now I am a sort of interdisciplinary social scientist who studies problems of the relationships among science, technology, environment, and society.” “Oh how interesting!” my new friend may respond with polite persistence, but what do you do?”

Purity and Danger
As one who received his anthropological training at the hands of Mary Douglas, I have no right to be surprised at my predicament. The work that brought Douglas to the attention of a wider community of scholars than those concerned with the exotic ways of West African tribal society in the mid 20th Century was *Purity and Danger*;[i] a study of ritual defilement that became an instant classic of modern anthropology.

The central focus of *Purity and Danger* is on the relationship between dietary restrictions and maintenance of the social order. Douglas argued that quasi-medical and economic explanations of Jewish dietary laws are not compelling for historical and logical reasons. (Health was never mentioned in this connection until Moses Maimonides writing in the 12 century CE. If pigs were hard to rear in the desert why would they not rather be prized as luxury foods?) She insisted that anyone seeking to understand the origins of *kashrut* should take the reasons for the rules offered in Leviticus seriously.

The foods prohibited to the ancient Israelites are all taxonomic anomalies. Pigs do not chew the cud like other cloven hoofed mammals that are not prohibited. Snakes are prohibited because they live on land, yet have no legs, as land animals ought to have. Similarly, crustaceans live in water yet lack the characteristics of true fish, fins and scales.

All, Douglas insists, are prohibited because they straddle boundaries that ought not to be crossed. As such they are monsters, to be abominated by a society intent on preserving its monotheistic identity from the encroachment of other racially identical nomadic peoples who worshipped multiple deities. Both forbidden foods and polytheist neighbours were seen as dangerous to society and, therefore, were to be shunned. A similar fate often seems to await those who fail to respect the boundaries of academe.

Disciplinary Construction of Ignorance

A particularly pertinent aspect of the danger that ill-defined borders present to scholarly disciplines arises because disciplinary boundaries are particularly fertile locations for the *social construction of ignorance*. The anthropologist, Evans-Pritchard first identified this phenomenon as *structural amnesia*,[ii] referring to the necessity of some East African political and judicial institutions to eliminate the memory of certain generations, recall of whom would irrevocably upset the present allocation of cattle rights.

It is convenient for some disciplines, such as neo-classical economics, to suppress their own ancestry, either in whole or in part. Outsiders may lament the bifurcation of the ancestral discipline of political economy. But economists prefer to forget their origins and view the emergence of market theory as a universal model for understanding human behaviour as their discipline's greatest triumph. Most seem surprised to learn that Adam Smith was a Professor of Moral Philosophy, Chief Tax Collector for Scotland and author of the *Theory of Moral Sentiment*? This latter work lays out a vision of civil society, as the precondition for the very existence of the free market described in *The Wealth of Nations,* yet is seldom recalled in the economists' view of their founding ancestor.

Structural amnesia as boundary maintenance is a spatial as well as temporal phenomenon. Indeed, the ability of disciplines and their learned societies to maintain their distinctive identities may depend heavily on maintaining ignorance about what lies across contemporary borders. Certainly, such forgetfulness is not confined to economists. In another example, leading psychologists periodically remind their colleagues that they tend to systematically ignore the social context of individual thought and behaviour.[iii] But heed to the warning is invariably short-lived. To admit the sociology of knowledge into psychology would be to blur the border between a relatively high-status discipline, protected in many jurisdictions by state licensing requirements, and the generally disparaged discipline of sociology (I say this sympathetically as I am currently, among other things, a professor of sociology). Hence, there are strong institutional pressures on psychologists to forget society.

I don't tell these stories to berate my friends in economics and psychology, alongside whom I have laboured in close proximity for over two decades. Actually, I want to encourage them to cherish their disciplines identities because it is only when they are confident of their core identities that practitioners will feel safe enough to allow their borders to become permeable, without abandoning them altogether. I maintain that this is the key to successful interdisciplinary work.

Marginality and Social Criticism

Danger is one dimension of social marginality. But there is another. Marginality is often a prerequisite for social critique. As Douglas' erstwhile colleague Aaron Wildavsky reminds us in his paper "Pollution as Moral Coercion,"[iv] "Risk taking and risk aversion are forms of social commentary." Choosing which risks are

acceptable to a society, while rejecting others, is part and parcel of defining which groups we belong to and which we seek to distinguish ourselves from. He might have added that the relationship is symmetrical. Social commentary is risky. It involves challenging established patterns of social solidarity.

Only by dissolving solidarity can one escape the imperative of commentary that is committed to the form of social bonding from which it emanates. The stylite atop his pillar at the busy crossroads or the hermit on his mountaintop is literally on a different plane. She sees the world differently. She can view the total landscape, not just the local features. In particular she can grasp the connections that hold the whole together, but cannot be made from within without threatening the boundaries that give each social grouping its distinctive identity. The price is separation from the communities below. But, contrary to the old saw "Everyone's a critic," criticism is not for everyone – at least not as a way of life. As the hermit climbs back down from the mountain, the road inevitably leads to one or another of the communities visible from the lonely peak. As that community reasserts its own situated view of the world, the hermit is obliged to forget, or at least remain silent about the view from the top. I call this tension between critical capacity and social engagement the Hermit's Dilemma. Perhaps it goes some way to explain a couple of features of interdisciplinary work.

Paradox of Mainstreaming Interdisciplinarity

First, the Hermit's Dilemma presupposes the existence of thriving disciplines, a landscape populated by diverse communities with their own languages and customs. Here lies the paradox for those who see the future of scholarship in the mainstreaming of interdisciplinary work, the ultimate triumph of Mode 2, or the creation of a universal transdisciplinary discourse[v]. By definition, a universally interdisciplinary landscape would be an intellectual monoculture. Without thriving disciplines, the very idea of interdisciplinary discourse becomes moot.

Second, the hermit's dilemma, the choice between critical holism and marginality, on the one hand, and engagement, effectiveness, and community on the other, seems to be reflected in the fact that the overwhelming majority of scholars engaged in interdisciplinary work do so only for part of their careers. Their excursions into interdisciplinary activity are adventures, stimulating intellectual vacations punctuating a lifetime of labour in a mainstream field. Only a small minority of scholars elect to spend their working lives on the margins, surviving, even thriving, in interstitial ecological niches from which, under the right conditions, their critical perspectives periodically emerge into the mainstream to challenge received wisdom and conventionally unquestioned practices.

Ambivalence of Established Institutions

This marginal minority of committed interdisciplinary scholars is a resource to be nurtured. Besides critique, marginals may be better adapted to the weaving of whole cloth from the threads spun and dyed by their disciplinary counterparts. They may be more likely to mix fibres and colours that challenge and provoke more refined specialized tastes. Herein lies the danger that the spinners themselves may be repulsed by such vulgar application of their carefully controlled product. Interdisciplinary work runs the danger of being knowingly indulged as "ambitious synthesis," or outrightly dismissed as "derivative," or worse, "parasitical." When insights from interdisciplinary research do make their way back into disciplines, they are likely to be represented as originating from within the discipline and the identity of the original outside innovator suppressed by the very structural amnesia or social construction of ignorance described above.

Hence, established institutions are ambivalent about marginality. On the one hand marginal scholars can provide important critical perspectives that cannot be obtained from within. They can also make novel connections across knowledge borders. On the other hand, marginals also threaten the very boundaries that constitute the established order. Perhaps this partly explains why so many universities, especially in the

United States, loudly proclaim their interdisciplinary commitments, while conducting disciplinary "business as usual" within their academic departments, and declining tenured positions to those who stray too deeply into the academic no-man's land of long-term interdisciplinary work which cannot be judged by unambiguous departmental criteria.

There is a corresponding ambivalence on the part of the interdisciplinary practitioner. There is a certain frisson in living on the edge. There is an undoubted attraction, at least for some personality types, in making connections and identifying misconnections and knowledge gaps that others miss. On the other hand she is likely to experience at least some frustration at the lack of formal recognition in titles, prizes, and resources that disciplines and their institutions bestow upon their own. The excitement of interdisciplinary work is often its own reward – which is just as well since its practitioners are often punished for their impertinence, not overtly, but simply by being denied the more conventional rewards of disciplinary scholarship.

Importance of Interdisciplinary Ecological Niches

The particular ecological niche, which supported my own evolution as an interdisciplinary scholar, was for 18 years the US Department of Energy's National Laboratories. Working in highly diverse and organizationally fluid groups of social and natural scientists we were highly problem focussed, rewarded by results, and paid only scant attention to disciplinary identities. At Oak Ridge National Laboratory (ORNL) through the 1980s, and at Pacific Northwest National Laboratory (PNNL) through most of the 1990s, I worked on a wide range of topics including:

- Technological and environmental risk perception and management
- Societal recovery from natural and anthropogenic disasters
- Accessibility of the Strategic Petroleum Reserve
- Socio-economic impacts of industry-wide changes in nuclear fuel production
- Technical innovation in electric and water utilities
- Socio-economic impacts of defence facilities
- Public participation in decision making for the environmental restoration of heavily contaminated sites
- Human and policy dimensions of global climate change.

As Leader of the Global Change Group at PNNL, I built and managed a group of 20 scholars whose various degrees spanned more than 30 disciplines across the natural and engineering sciences, social sciences, and humanities. By the time I left PNNL in 1999, I had attained the highest scientific rank in the organization, despite the fact that social scientists made up only a tiny portion of the lab's scientific and engineering staff. There are few, if any, institutions of higher education, at least in the Anglophone world, in which I would have been able to build such a rewarding career on such a thoroughly interdisciplinary foundation.[vi]

Throughout this period I actually found myself working in any of four modes, sometimes simultaneously. We conducted:

- Disciplinary research which respected the specialized division of scholarly labour
- Multidisciplinary research, in which issues or problems could be defined by one discipline, but required input from other disciplines to identify solutions
- Interdisciplinary research, where issues could not be adequately defined, let alone resolved, by any single discipline
- Interactive research in which interdisciplinary scholars engaged with what might be traditionally called "subject" and "user" communities to resolve (or at least redefine) issues that could were otherwise intractable.

I am aware of many frameworks that define these terms in different ways and also introduce additional ones such as *transdisciplinary*. It is pointless to argue which framework is best. I merely offer this one in an effort to communicate the complex character of the research and interaction that we were able to pursue.

Seven Pillars for Interdisciplinary Projects

From my experience in the National Laboratory system, I would identify at least seven conditions that contribute to the success of any successful interdisciplinary research project or programme.

The most important is that only projects driven by a concrete problem, which has some prospect of being made more tractable, have a prayer of success. No matter what personnel or resources you may have to throw at a topic, a poorly defined, vague, abstract, or grandiose problem formulation will not grab and retain the focussed interest of the researchers. They will soon balkanise the issue and the funding and revert to pursuing more narrowly disciplinary sub issues.

Second, is that the participants in interdisciplinary research should be selected for a combination of confidence in their disciplines of origin and openness to other ways of viewing the world. Openness usually depends on confidence disciplinary self-confidence, but is not guaranteed by it. Scholars who are not secure in their own domain tend either to be reluctant to step outside of it or, conversely, may be easily intimidated into giving up disciplinary ground that they ought not yield. This is the model of confident, but permeable, disciplines that, I have already argued, is absolutely essential to interdisciplinary success.

Third, I would argue that any project needs to have a critical mass of participants from the “minority” disciplines. A single hydrologist faced with an army of sociologists, anthropologists, and political scientists, is unlikely to be a full player in problem definition and will be relegated to the multi-disciplinary role of technical advisor. The same applies to any combination of disciplines.

Time for confidence building is my fourth requirement. Unless the team has collaborated successfully before, each member will require time to assimilate each other’s expertise and the language in which it is expressed. They will also need to learn what can be delivered in what time frame and using what proportion of available resources. False starts and misunderstandings are inevitable. Indeed, they may be exactly what is required to stimulate new approaches and ideas.

Fifth, a supportive reward structure is also essential. A major problem for academic research institutions is also their major strength. They tend to be organized along disciplinary lines, which supports my second desideratum, but tends to undermine this one. In particular, post-doctoral researchers and junior faculty can find their long-term career aspirations blocked, if only because their rate of publication is slower than that of their disciplinary colleagues or that it is often difficult (indeed, it ought to be impossible) to identify exactly what contribution to the project each individual participant made.

An influential “audience” for the research is my sixth ingredient. This condition complements the first in my list. No matter how intriguing the research problem or its potential outcome, it is not likely to proceed very far or fast unless the participants see themselves as addressing an audience that could act on it. Disciplinary scholars always know their audience – it is themselves. Interdisciplinary researchers, almost by definition, have at best an ephemeral peer group. Since no one likes to perform to an empty theatre, identifying an audience that can act on the research is an important ingredient in its success.

Finally, it helps to have some experienced professional weavers on the team. Partly this is a matter of prior experience with the operational problems and challenges of building collaboration across disciplinary boundaries. Partly it is a matter of conflict resolution and an ability to keep people engaged when they

become frustrated with other participants. Partly it is matter of knowledge, of being aware of and able to make the initial connection between threads that have been spun in isolation from another. Often the role is pastoral or therapeutic as much as it is intellectual and scholarly. In this respect it is very much in the realm of craft skill, and is often hard to evaluate. (This aspect of the role may be another clue as to the ambivalent regard in which such practitioners may be held by traditional academics, who at various times in history have resisted the incorporation of various "crafts" from engineering to business into the university curriculum.)

Interdisciplinary Utopianism Versus The Groucho Factor

My final success factor brings me back to where I started. One response to marginality, especially to peer group ephemerality has been various proposals to formalize interdisciplinary studies into new disciplinary fields. In the past couple of decades, we have seen various examples of this. For example, some scholars have patiently and nobly laboured against the odds to establish departments of Science and Technology Studies. Others have nursed quiet reservations that formal departmentalization would result in domestication. To these critics, the older, more unruly (undisciplined?) field of Science and Technology Studies sometimes seemed to have a bit more bite than its modern descendant.

Hence, I admit to being ambivalent about the emergence of grand unifying visions of interdisciplinary or transdisciplinary science, as represented by the International Centre for Transdisciplinary Research[vii] or the Harvard-based Sustainability Science initiative[viii]. The very notion that all knowledge should or could be systematized in a universal overarching interdisciplinary framework appears to contradict my experience of what makes interdisciplinary research exciting and fruitful.

As a former student of millenarian movements, I am particularly uncomfortable when such grand visions are presented as imperatives to avoid planetary catastrophe, as is the case with the CIRET *Charter of Transdisciplinarity* or the Sustainability Science Initiative's *Statement of the Friiburgh Workshop.* Prophesies of doom are the stock in trade of coercive social movements claiming to know the secret of salvation, liberation, or even mere survival. However, the track record of such movements delivering on their promise is not encouraging.

In the final analysis, exhortations to interdisciplinarity as an end in itself, or as the key to planetary survival amount to the same thing. As Andrei Cornea argues,[ix] they combine a romantic idea of unified nature with the desire for a panoptic standpoint from which to manage it. In the final analysis, successful interdisciplinary work relies on appropriate problem framing. It must be problem driven. Problems that have no solution, such as planetary survival, are not problems at all.

Interdisciplinarity as a utopian social movement, whether within science or among a wider public may lead us away from the creative tension of marginality and contested knowledge towards a bland systems-theoretic orthodoxy for the instrumental management of nature and society. This would be the intellectual monoculture I spoke of above. Although it is messy, and often uncomfortable, I am inclined to persevere in my Marxist habit (that is Groucho rather than Karl) of declining membership in any club that would actually have me.

The Science in Society Programme - Coming in from the Cold?

It is reasonable to ask how I reconcile this intellectual disposition with my current role as Director of the Science in Society Programme, a major research initiative of the UK Economic and Social Research Council. My answer is that this is exactly one of those circumstances in which the mainstream environment provides the right conditions for a determinedly recidivist interdisciplinary scholar to emerge from the cracks.

This programme is designed to be:

- Interdisciplinary across the social sciences.
- Interdisciplinary in its interactions with the natural and engineering sciences.
- Interactive with public, private, and civic decision makers.
- International in its scope and collaboration.

The programme is, at least in part, a response to a widespread perception that there is a crisis of public confidence in the ability of science and technology to guide public policy in the UK. Certainly, this was the view expressed in a Select Committee report of that distinctly unmarginal body, the House of Lords[x]. Such a situation does not call for the *normal science*[xi] of disciplinary research. A longstanding experience of and commitment to interdisciplinary and interactive research is a comparative advantage in leading and coordinating such a programme.

To be able to avail themselves of the somewhat specialized skill set of self-consciously interdisciplinary scholars as particular research programmes may demand, the scholarly world needs to ensure that appropriate ecological niches are available to sustain interdisciplinary specialists in between major opportunities like the Science in Society Programme. European funding agencies seem to do quite a good job of this, although universities, for obvious reasons, tend to lag behind.

However, a lifetime commitment to interdisciplinarity should by no means be a requirement for everyone participating in the programme. The programme presents scholars from various disciplines with the opportunity to engage with their counterparts from others. Some of these collaborations may lead a minority of these scholars to continue to seek ongoing interdisciplinary opportunities, and these will join the ranks of those who thrive in ecological niches until their skills are again needed for a mainstream activity.

Hopefully the programme will encourage most participants to take advantage of future opportunities for collaboration across disciplinary boundaries. However, when all is said and done, I expect that many will return to their disciplinary departments and professional societies and journals upon completion of their projects. In truth, I would be horrified if all shed their disciplinary identities to the extent that I have done. In the absence of strong disciplines, in the grey, homogenized, borderless world of the transdisciplinary utopians, there would be no place for translators, intellectual smugglers, and rough guides across difficult and dangerous border crossings. In the final analysis, I too am driven to establish and defend the boundaries around my specialized field. Otherwise, I too would be out of a job.

[1] Douglas, M. *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo*, Routledge and Kegan Paul, London, 1966.

[ii] Evans-Pritchard, E.E. *The Nuer* Oxford University Press, Oxford, 1940.

[iii] Douglas, M. A Backdoor Approach to Thinking About the Social Order. Address to the American Sociological Association Annual Meeting, San Antonio, Texas 1984.

[iv] Wildavsky, A. Pollution as Moral Coercion: Culture, Risk Perception and Libertarian Values, *Cato Journal* 2:1, 1982.

[v] For example, see *Open The Social Sciences: Report of the Gulbenkian Commission on the Restructuring of the Social Sciences.* Stanford Univ. Press, 1995. Mode 2 was introduced in see M. Gibbons, C. Limoges, H. Nowotny, S. Schwartzman, P.Scott and M. Trow 1994. *The new production of knowledge: the dynamics of science and research in contemporary societies*. Sage, London. While this work suggests that interdisciplinary research in Mode 2 coexists alongside the disciplinary practice of Mode 1, the idea has been widely interpreted in evolutionary terms as Mode 2 displacing Mode 1. No ambiguity exists in the vision presented in *The Charter of Transdisciplinarity,* adopted at the First World Congress of Trandisciplinarity, Convento da Arrábida, Portugal, November 2-6, 1994.

[vi] Unfortunately this ecological niche, and comparable capacities at Oak Ridge and Argonne National Laboratories have withered due to the anti-DOE stance of Republican lawmakers who took control of the US House of Representatives in 1992 determined to do away with the department. Although they have not succeeded, they have managed through the appropriations process to decimate its policy-relevant social science capabilities.

[vii] See *The Charter of Transdisciplinarity* and other information about this movement at http://perso.club-internet.fr/nicol/ciret/english/indexen.htm.

[viii] See http://www.cnie.org/2000conference/30.cfm.

[ix] Cornea, A. This volume.

[x] House of Lords, Select Committee on Science and Technology, Third Report, *Science and Society,* HMSO, 2000. The report can be accessed at http://www.parliament.the-stationery-office.co.uk/pa/ld199900/ldselect/ldsctech/38/3801.htm.

[xi] Kuhn, T. S. *The Structure of Scientific Revolutions*. Aldine, Chicago, 1962.

Managing Interdisciplinarity
The Example of the Priority Program of the DFG: Global Environmental Change

Dr. Michael Scheuermann
Department of Psychology, University of Freiburg
& Knowledge Media Research Center, Tübingen

In this paper I'll try to share some experiences made during my work as the scientific co-ordinator of the priority program Global Environmental Change funded by the DFG. The experiences can maybe show how interdisciplinarity could be managed in a program consisting of a heterogenous amount of disciplines.

Definition of Inter- and Transdisciplinarity used in the program

The research in the program followed the definitions by Defila & Di Giulio and Gibbons. They describe the terms inter- and transdisciplinary as "the integration-oriented co-operation of individuals from at least two disciplines, towards common objectives, i.e., the synthesis of various disciplinary points of view, while "transdisciplinarity" refers to a special form of interdisciplinarity involving extra-scientific practitioners in research". That means that this forms of collaboration need: Consensus, Integration (Synthesis), Management, Diffusion, and in case of transdisciplinarity adequate participation of end-users (compare Defila & Di Giulio 2001, 338 and Gibbons et al. 1994).

Introduction: The Priority Program Global Environmental – Change, Challenges and Overview

The program had from its very beginning – which actually means from the period of planning and compiling the proposal – to deal with some challenges, some of them concerning the content of the research of the program some of them concerning the organizational dimensions of the program.

Challenge one was, "to lead people to environmental friendly behavior". Beside this task there were Challenge two "to lead researchers to communicate their results to lead people to environmental friendly behavior", and Challenge three "to work in an innovative way" (especially in the context of the DFG which had not funded such a large interdisciplinary program in the social sciences so far). That means that the researchers from the program had to work on approaches for new solutions for environmental problems and on new communication for solutions for environmental problems at the same time. Because the environment is a topic which is of special interest in the discussions in society and not only in the academic field, public understanding and public use of science e.g. the results of the program was one of the major tasks, too.

The program went from 1995-2000 in three funding periods of two years each. In each period about 30 projects were funded that means that about 100 researchers were members of the program at the same time. The program consisted of a broad variety of scientific disciplines: Anthropology, Economy, Geography, Psychology, Political Sciences, Sociology and it had disciplinary and interdisciplinary projects. The budget was 10 Mio Euro for the whole time 1995-2000.

The major goals and objectives of the program were (taken from the proposal):

1. Research on perception of global environmental change and on behavioural consequences.
2. Analysis of political and economic aspects of the causes of global environmental problems and strategies to master them.
3. Analysis and comparison of strategies for using resources in endangered ecological systems of the Third World.
4. Proposals for solutions of global environmental problems.
5. Collaboration and coordination between different research disciplines.
6. Reformulation of theoretical approaches, improvement of methods and extension of research paradigms over disciplinary boundaries.

Management of Interdisciplinarity in the Program and Positive Side Effects

The research in the program was structured among five task forces. These task forces were built up in a top-down process (suggestions by the speaker and the co-ordinator) and in a bottom-up process (changes of the topics of the members of the program). The task forces were:

1. Risk Perception and Information Processing.
2. Multidisciplinary Approaches to Change Behaviour.
3. Institutional Dimensions of Global Environmental Change.
4. Global Change and the Commons Dilemma.
5. Environmental Perception and Coping Strategies in Endangered Ecosystems in the Developing World.

In each task force researchers from different disciplines had to work on the underlying problem. That means the task forces became an arena of interdisciplinarity. Each task force should meet twice a year and there were joint meetings with all the task forces and guests and in co-operation with partners. The task forces took also the opportunity to organize some transfer meetings with partners outside the scientific community to discuss their results with ”users”.

From the beginning of the program the management structure consisted not only of a chairman/speaker, but also a co-ordinator with the tasks of an executive manager. A steering committee consisting of the speaker of the program, the co-ordinator and the speakers of the task forces was also in charge of the management of the program.

Other Management „Tools“ (only in a short list) are:

- Several ways of information (top-down and bottom-up).
- Junior scientist network.
- Joint media/press information.
- A process of self evaluation.
- Joint products.
- Corporate Communication and Organizational Development.

The program was a starting point of three innovative initiatives:

- A research co-operation in the field of science/research management.
- An exploratory project funded by the DFG as a starting point for training in science/research management including the development of a management-handbook for program-management.
- An interdisciplinarity network of junior scientists.

Some Perspectives

- Management of such programs is a specific task and not the task of the researchers.
- The program management is responsible for corporate culture and corporate identity on program level.
- A vision and a mission of the program should be designed.
- On group level standards of team reflexibility should be implemented.
- Consequent implementation of corporate communication in an organizational development process could be helpful for research programs.
- Modern management tools like corporate communication or organizational development not only promote the exchange within a research program but also facilitate the discussion with partners or users outside the program.
- Even if concepts from industries or profit organizations are not yet very common in research programs at universities, we should try to work with such models.
- Top-down processes as an initiative of the program leaders or a steering committee and bottom-up approaches from the members are important to foster communication and collaboration to achieve inter- and transdisciplinary goals.
- For successful cooperation between the projects an adequate structure of communication must be found on all levels of the program: On the program level, on the level of interdisciplinary task forces consisting of a couple of projects, and on the level of each individual project.
- Program management could only be responsible for program level and group level and should not intervene in the structure and the discussion of the different projects themselves.
- All members of the program should engage in at least one interdisciplinary task force, send reports and information to their task forces and to the program management, and make references to the program in their own publications.
- Effective information tools used by the program leaders are: regular newsletters (only for the program members), providing information about the organizational and structural status of the program, the promotion of joint interdisciplinary publications, the editing of joint program documentations (for the members and for research partners and people outside), the development of a program logo, the organization of regular meetings on the group level to provide enough time for group discussions and exchange, the development of a media concept with strong participation of the projects and an electronical infobase in the World Wide Web including discussion forums.
- Program managers need training in science/research management.
- During the joint meetings, discussion should not only take place between projects from one discipline, but also between projects from different disciplines with similar research goals, and between the members of the program and people who are not researchers.

- Environmental research is a very important area for inter- and transdisciplinary questions. Solutions of environmental problems will only be possible in an integrated process between social and natural scientists from many disciplines and users like policy-makers, etc.

- Researchers should remember their duties to communicate their approaches and results from the beginning of their work to their colleagues and to other communication partners.

- Corporate communication is a practical tool to start discussions and to promote communication at all levels, because it reflects on the communication between the members of the program and between the program and its environment in an integrated approach.

- Members of such programs should be trained in using communication tools and should be informed about the specific corporate communication in the program.

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Chapter 5: Cross-disciplinary research in specialised institutions

Finally the third and last group of proceedings are focusing on cross-disciplinary research in specialised institutions. Unfortunately only French and German institutions are presented in this chapter, but even within these two countries a remarkable variety of ways to institutionalise research crossing disciplinary borders are displayed.

Institutional Conditions of Interdisciplinarity in the Maison des Sciences de l'Homme (Paris)

Hinnerk Bruhns (CNRS / MSH)
Directeur de recherché au CNRS; Adjoint a l'Administrateur de la Maison des Sciences de l'Homme

Introduction

The question of interdisciplinary has been broached in numerous publications and the requirement of interdisciplinarity can frequently be found in the constitution of research programs managed by research agencies or ministries of research.

These programs that often carry the title of 'interdisciplinary program' are only one of the possibilities for the promotion of interdisciplinarity via institutional mechanisms. A very different way of doing so is that of the ZIF in Bielefeld, also present in this workshop, that invites researchers from different disciplines in residence for the achievement of a common project. Another and more frequently used way of approaching interdisciplinary is that of the IAS (Institutes for Advances Studies, represented in this conference by the Wissenschaftskolleg Berlin) that brings together, in residence, researchers from different disciplines with individual projects thereby provoking 'spontaneous' interdisciplinary contacts.

The Maison des Sciences de l'Homme in Paris does not belong to any of these three different approaches, but it nonetheless combines several of their elements. Interdisciplinarity is here an objective and a reality lived by all without being a constraint. We could provide a detailed presentation for example of interdisciplinary research groups within the MSH but we have preferred to give an institutional type of presentation so as to bring forward the institutional, infrastructural and material conditions that can favour interdisciplinarity in the Social and Human Sciences.

Presentation of the Fondation Maison des Sciences de l'Homme

Founded in 1960, on the initiative of Fernand Braudel, the Maison des Sciences de l'Homme Foundation (MSH) is dedicated to the promotion and support of research in the social and human sciences. It constitutes a platform for collaboration between institutions, researchers and research groups, and between disciplines on both a national and international scale. The MSH Foundation aims to uphold and renew a constant dynamic of scientific research. The initiatives it has developped for that purpose are anchored within the double perspective of multidisciplinarity and internationalisation of research. The purpose of internationalisation is not so much to develop research in specific geographic areas as to promote, through co-operative efforts, the emergence of new domains of scientific enquiry.

The MSH Foundation brings together, under one roof and around a set of common instruments, research centres affiliated to various institutions (the Centre National de la Recherche Scientifique, the Ecole des Hautes Etudes en Sciences Sociales, the Fondation Nationale des Sciences Politiques, the Paris

universities, etc). It organises national and international networks devoted to scientific co-operation and the transfer of knowledge. In France, it works with the main research institutions, universities, and with the network of Maisons des Sciences de l'Homme that is established in the main university towns. All over the world, its international action is rooted in partnerships with major foreign institutions.

The Foundation establishes or receives, for a limited periods of time, experimental groups seeking to determine new directions and methods for research in the social sciences. It encourages dialogue among researchers, through symposia, round tables, workshops and the Internet. It is also concerned with the collection, publication and dissemination of scientific information though the means of its publishing house and on variety of scientific levels.

The Foundation possesses a number of facilities and tools that it places at the disposal of researches: a national research library, a publishing house, scientific journals, newsletters, a computer service, an inter-institutional centre for the diffusion of publications in the social and human sciences. The infrastructures are at the disposal of French and foreign researchers who are invited by the MSH. On average, between 500 and 600 foreign researchers are invited by the foundation annually (symposia not included).

The MSH Foundation is governed by a board of directors comprised of de facto representatives of the supervisory agencies and the major French teaching and research institutions, as well as members of the scientific community known for their competence and experience. It is headed by an administrator appointed by the French Ministry of Research at the proposal of the Board of Directors. Its activities are subject to an annual scientific evaluation by an international committee appointed by the Board of Directors. It derives its funding from subsidies, gifts and donations, as well as from its own resources. It combines private-sector management with public sector controls.

The MSH Foundation is housed in the Maison des Sciences de l'Homme building (54 bd Raspail, 75006 Paris), which it shares with the Ecole des Hautes Etudes en Sciences Sociales. With the Maison Suger (16-18 Rue Suger, 75006 Paris), the Foundation disposes of an international residence for visiting senior scholars which provides a housing capacity of 35 apartments as well as research facilities, seminar rooms and work and leisure areas.

The MSH thereby accomplishes the function of providing a research infrastructure for social and human sciences that offers to French and foreign researchers a plate-form of co-operation on:
- a) An institutional level,
- b) An international level,
- c) An interdisciplinary level.

A. The institutional level

The MSH is at the disposal of the entire research community. It welcomes and supports within the framework of its projects:
- Professors and researchers from Parisian and regional universities
- Researchers from the Centre National de Recherche Scientifique (CNRS), the Fondation Nationale de Sciences Politiques (FNSP), etc.
- Researchers from the 'grandes écoles' and from the large institutes for teaching and research.

The majority of these 'exterior' institutions are represented in the board of directors of the MSH.

B. The international level

Nearly all the programs and projects that are supported by the MSH include an international dimension. Many of them have been conceived and are co-ordinated by foreign researchers. The international policy of the MSH is implemented with the help of a large number of instruments:

- The invitation of foreign researchers for research stays (of different lengths. As such, the International Programme for Advanced Studies differs from the standard policy followed by many Institutes for Advanced Studies. The MSH does not offer long-term fellowships to individual scholars, but only medium term fellowships for collective research. In practice, such a policy favours the constitution of a core group of three to five scholars, living in residence for three months or so, and working together with French colleagues, themselves being parts of a research centre or a research network.
- The bilateral exchange and co-operation programs (the most important of these: China, India, Brazil, Mexico, Germany, Russia etc.).
- The postdoctoral scholarship programs for young researchers from certain countries: Diderot program (countries of the ex-USSR), Mellon program (Central Europe), DAAD/MSH program (Germany), etc.

Also, in some ways, the MSH through its daily activities is a sort of agency 'of international co-operation in social sciences and humanities, frequently used by the French ministries to enact actions of international scientific policy - acting in a fully independent way and according to scientific criteria, for which the ministries themselves are not sufficiently equipped.

C. The interdisciplinary level

The internal structures of the MSH do not reflect the disciplinary structures of the academic world even though a majority of the centres housed by the MSH have a disciplinary identity. An openness of their research program to other disciplines is one of the criteria that governs the selection of the research centres that are housed as well as of the other types of research groups. The spatial configuration of the MSH is one of the factors that favours first interdisciplinary interactions and then co-operations. A great number of laboratories and research groups from practically all the areas of human and social sciences: history, anthropology, sociology, psychology, economy, geography etc. are brought together in one building, around a research library, and other common installations. The presence in the MSH building of centres specialised in geographic or cultural areas (China, India, Brazil, Russia etc), which by definition ought to be already interdisciplinary, is an additional predisposing factor of dialogue between specialists from different disciplines.

Inter- and pluri-disciplinarity is not only a product of the *genius loci*, it is also a given priority in the objectives of the scientific policy of the MSH. This policy is enacted by the scientific board in the MSH through the centres that are housed there, the research groups, and with the individual researchers (French or foreign) that are invited through a variety of initiatives. This scientific policy is implemented through both individual actions and 'Thematic actions'. In the present quadrennial period (2002-2005), the main "interdisciplinary thematic actions" of the MSH are:

- History and social sciences;
- Archaeology, technique and material cultures, history of ancient societies;
- Economy, models for development and transition;
- Psychology and societies;
- Languages, texts, communication;
- Elite's, intellectuals, sciences of education;
- Methods and history in social and exact sciences;
- Food and agriculture;
- Law and justice;
- Space and society: cities and urbanism, geography and geopolitics;

- Ideas, ideology, policies and religions;
- Sex and gender;
- Arts and aesthetics;
- Cultural areas.

The mode of implementation of the thematic interdisciplinary action is the following:
All of the scientific operations grouped together under the title of 'thematic action' come under a double logic of both network creation and development of the international co-operation that animates all of the MSH programs. The purpose is here, on the basis of their proposals, to bring French researchers from different disciplines and institutions together, with in most cases their foreign partners, to accomplish projects of common interest proposed by them but that cannot, or at least cannot yet be enacted by other institutions. In this perspective, the MSH serves as a framework for experimentation and incubation, allowing for a fast response to the researchers demand to exploit an idea or launch a project. It does this by bringing together the necessary funding for the initial phase, and then by helping the researchers involved to find the necessary aide from other organisms to pursue their enterprise.

The rules for each operation that is realised or initialised are at the first stage:
- The definition of precise objectives, limited in time (a scientific project, work groups, final results that take mainly the shape of individual or collective publications);
- The pooling of resources;
- The rapid renewal of the themes that are broached and treated.

Also, for a second stage:
- An effort to structure the research in new areas in a sustainable way, through the creation of work groups that could, if this appears to be justified and necessary, constitute more elaborate and diverse networks. These networks can then give themselves a more autonomous organisation, for example, in the shape of an international association.

The international co-operations developed by the MSH play a central role of aide, council and networking in the definition and renewal of these projects, as well as in the constitution of the research teams involved. During the course of the past twenty years, an important part of these projects have thus developed in the frame of Western Europe, thereby contributing to a better integration in the area of European research and to the emergence of problematics and conceptions that are adapted to the specificities of the European intellectual traditions and societies. A European platform has thus been created, allowing for discussions on an equal level with American researchers, integrating in the past ten years researchers from central and eastern Europe, and initiating joint operations with researchers from other continents (Japan, India, China, Africa, Latin America).

These different projects, that closely associate the three fundamental criteria (inter-institutional, inter-disciplinary and international) of MSH interventions, are currently regrouped into fourteen chapters (cf. list given above) that define the fields of convergence between the researchers and the interdisciplinary reflections. Their achievements take different forms depending on the case and the needs expressed:

- Research groups, working on a specific theme, through regular seminars and/or periodic international reunions.
- Permanent scientific networks of which the activities are renewed by smaller groups that are formed within them.
- Finalised research programs in a position to obtain funds that will not only cover their meetings but the research itself.

- Invitation of foreign researchers who may integrate themselves into an existing group or network or may create a new group on a new theme.
- Publication of results in scientific reviews, or in works edited in France by the MSH, by another private or academic editor, or abroad.

Conclusion

In universities or organisations such as the CNRS, one of the major difficulties encountered by inter-disciplinarity lies in successfully making researchers, who within these institutions are part of a constituted disciplinary body, work together around a common project. In relation to such configurations, the MSH, presents a very individual case: it offers to exterior researchers, to its temporary guests, and to the French researchers hosted for long time periods, an area for interdisciplinary as well as inter-institutional and international encounters. The FMSH then intervenes in three ways for inter-disciplinarity:

- Amongst the projects that are submitted within its walls and outside, it favours those that carry an interdisciplinary dimension.
- It actively provokes meetings and collaborations between researchers from different disciplines.
- It puts support and instruments that can go from the temporary allocation of a work area to the creation (and temporary support) of a scientific review, at the disposal of researchers that carry forward an inter- or pluri-disciplinary project.

Interdisciplinary Research and Organisation: Towards a Model?

Denis Bouget
denis.bouget@sc-eco.univ-nantes.fr
The *Maison des Sciences de l'Homme* in Nantes.

"Only knows chemistry does not even know chemistry"
Georg Christoph Lichtenberg, *Aphorisms*

Interdisciplinary research is often described as a marriage between conceptual frameworks and methodologies reflecting the need to bridge not only the different scientific representations of the real world, or the sharing of understanding among researchers, sometimes the compiling of common dictionaries of terms and concepts or the definition of new common objects of research, etc. All these scientific ambitions are supposed to avoid the drawbacks to disciplinary research such as the narrow compartmentalisation of knowledge, a specialised communication of scientific knowledge, 'black holes' in scientific knowledge, the risk of a tunnel-like vision, unintelligible jargon, etc. Conversely, interdisciplinary research would lead to creativity for new scientific knowledge in that the very act of creation often brings previously unrelated ideas together.

In reality, the pure model of disciplinary research is rare (Lichtenberg's aphorism means that disciplinary research cannot exist) because it often contains a certain amount of interdisciplinary activity that is often unknown or under-estimated and sometimes concealed for strategic purposes.

Many analyses of interdisciplinarity focus on the theoretical problem of its legitimacy in a given area of research and on its efficiency in producing new scientific knowledge. This daily quest for legitimacy is a prerequisite for survival of interdisciplinarity in the face of supposed established and monopolistic disciplinary research. Such a way of thinking leads to a substantialist analysis of interdisciplinarity: what interdisciplinarity is and what it is not. What are the borders which make it possible to define interdisciplinarity in relation to disciplinary research? What are the different dimensions of interdisciplinarity? The aim of the substantialist analysis is to produce the content of interdisciplinarity as a universal concept which encompasses both social and human sciences in the same way as the other scientific domains.

The chapter is neither a criticism of the legitimacy of interdisciplinarity or that of the attempt to define a universal concept. It points to a disregarded dimension of interdisciplinarity**,** i.e., its organisation. In this sense the paper waives the substantialist approach in favour of an institutionalist analysis of the problem, because it is a problem which largely and simultaneously explains the success and the failures of interdisciplinarity in research policies. In fact, the debate on interdisciplinary/disciplinary research is largely dominated by the real organisation of research in many countries. Any sharing in disciplinary/interdisciplinary research largely depends on the historical organisation of research and is also submitted to "path dependency" which explains the difficulty in creating and extending new interdisciplinary research centres.

As regards the French context and the organising of both humanities and social research, the programmes of interdisciplinary research require specific organising which automatically appears as a new fief against former fiefs in the fray for scientific recognition and the hunt for subsidies. The presentation of the MSH-Nantes is included in a more general presentation of the organisation of research in social fields and humanities (I). Within the organisational framework we note the difficulties in organising interdisciplinary research (II) and the attempts at setting up new interdisciplinarity institutions (III). Finally, we will present the main features of the MSH-Nantes (IV).

I Disciplinary organisation of research

Research is often analysed as disciplinary because the organisation of the research centres and the organisation of the individual career of each researcher are largely based on an academic discipline (sociology, law, geography, etc). In Nantes, the research centres are located within disciplinary departments of the university, in the engineering schools or in the Nantes School of Architecture. Most of these are very small and fragmented, they are specialised in one discipline and they operate in a narrow field. Some of these are called CNRS units and others the Ministry of Research refers to as "*Équipe d'Accueil*", "*Jeune Équipe*" or *Équipe Émergente*". Sometimes, these centres assemble many colleagues from the same department but only one variable section of the members really produces new articles or books. Whatever the pros and cons of this organisation, it is the dominant part of the general organisation of research in an environment such as a university, a town or region.

The occupational career of teachers and researchers is managed by national commissions which are also divided according to disciplines and sometimes to more specialised sub-disciplines.

Finally, the organisation of research in Nantes is typically a local copy of the national organisation of the structure of teaching and research which leads to the promotion of disciplinary research. However, this picture is over-simplistic. Firstly, in the university, personal relationships sometimes dictate interdisciplinay projects of research. Secondly, some research centres are built like open centres, that is centres which support the idea of including researchers who come from another discipline. In the third place, the different reforms directed at certain university courses are gradually opening new degree opportunities which have a greater interdisciplinary basis than that of defending an academic discipline. This extension to interdisciplinary teaching programmes is especially prevalent in the new Masters Degree courses and in the development of new "*Écoles doctorales*" for PhD doctoral students.

Whatever this process of openness, we rarely see real interdisciplinary research teams at this primary level of research organisation.

Information on Nantes

Location: Near the west cost of France.

Agglomeration: 550 000 inhabitants.

University of Nantes: Pluri-disciplinary university (humanities, social sciences, mathematics, physics, chemistry, medecine, etc.); 33 000 students; 73 centres of research.

Engineering schools: *école centrale*, *école des Mines*, *école vétérinaire*, etc.

II Difficulties in interdisciplinary research programmes and organisation

At the national level and over the last several years, the Ministry of Research and CNRS have been trying to boost interdisciplinary research through the creation of specific institutions (Federative institutions, *Maisons des Sciences de l'Homme*- MSH- in humanities and social sciences, etc.).

Today, national and European calls for research programmes often impose interdisciplinarity on the researchers' proposals. A conceptual presentation of interdisciplinary research is not very difficult, but we rarely see any consistency between the programmes and the organisation because they are created within an organisational framework which largely depends on the historical structuring of the research within each individual country. Part of the issue between disciplinary and interdisciplinary research is that many

presentations of interdisciplinary research focus on a single problem which does not encompass all the organisational problems of the initial project. Consequently, every researcher is frequently under the constraint of interdisciplinary research which is incompatible with the local research organisation. In fact, interdisciplinary research implies a simultaneous analysis of the content of the programmes and their organisation (co-ordination, financing, management, etc.). This leads to an organisational multilevel which provides the basis of the chapter.

In this primary organisation, any attempt at multidisciplinary or interdisciplinary research sparks a great deal of difficulties. The first one is the inadequacy of the national proposals faced with the actual and daily organisation of the research. National proposals are often initially attractive and very consistent but they are impractical given that the real structuring of the research cannot absorb them without a serious change in the management of the centres. Therefore, the first consequence of the introduction of interdisciplinary research is a destabilisation of the previous disciplinary research organisation.

The second consequence is the non proposal for these programmes by any stable organisation or institution. The creation of interdisciplinary research appears as local agreements, accompanied by a plethora of problems relating to power-sharing between the different relevant directors or researchers.

The third consequence lies in the dismantling of the homogeneity of the disciplinary organisation of research. In the process of re-organisation, some centres become specialised in interdisciplinary research, others remain linked to disciplinary research. This duality is rarely planned or organised. The result is not based on any efficiency criterion, that is, the creation of organisational schemes or rules which facilitate the working life of the researchers. As a matter of fact, it is more the historical result of local agreements between directors of centres or of individual agreements between the researchers.

The fourth consequence is that it is difficult to locate interdisciplinary research. When there is no institution for interdisciplinary research, the management of interdisciplinary programmes remains the responsibility of disciplinary centres. This inadequacy between the programme and the organisation can jeopardize the visibility of the programme, and cause conflicts among researchers involved in the programme as well as between the researchers who are involved and those researchers who are not involved in the programme.

III New institutions for interdisciplinary research

We need to distinguish two levels in the organisation of the research. The first level contains centres of research, laboratories, especially in humanities and social sciences: it is the "primary" organisation of the research.

The gradual development of interdisciplinary research has highlighted the need for several new institutions focusing on interdisciplinary research which can be called the secondary tier of research. We can encounter several types of institution as follows.

The first type of institution is a new centre of research which is defined as an interdisciplinary centre. In this case, the researchers that come from different disciplines are permanent researchers within the centre. The inconvenience is that the researchers partly lose ties with their disciplinary centres. This creates further fragmentation inside the centres and within the primary organisation dominated by the disciplinarity. In fact, it becomes a new type of primary centre of research and competes with the other disciplinary centres.

Another organisation refers to the principle of federation and the principle of subsidiarity. The second type of research is called in French : the "*Plateau Recherche*". This means that several disciplinary teams of researchers work in one building, sometimes as a disciplinary centre (*Maison de l'Économie* in Paris).

Sometimes, several disciplinary teams are located in the same place. In this case, we can say that this type of organisation refers to multi-disciplinary research. Several MSH have also been created on this basis. This organisation has several features. The disciplinary organisation and links remain stable. The second advantage lies in the scale of economies created in the daily management of the research, i.e. services can become a "club goods", in that they are shared between a larger number of researchers. Thirdly, a single location can improve the inter-individual contacts in favour of new interdisciplinary projects.

A third interdisciplinary institution, as in Nantes, is a "*Pôle Recherche*". In a *Pôle Recherche*, several centres in disciplinary research decide to pool specific knowledge under a common name or domain, without any new type of legal institution and common location in a building. The advantage is that every disciplinary centre keeps its originality, and the pole becomes a kind of banner under which the new interdisciplinary research may be launched. However, this is the development of interdisciplinary research within a very weak organisational structure. In time, this will result in an unstable or sub-optimal institution. It is difficult to conceive this structure as a permanent institution. However, it can be useful and conceived it as a step in the long process towards the creation of a more efficient organisation for interdisciplinary research.

IV Maisons des Sciences de l'Homme: the Nantes case

Another type of institution for interdisciplinary research is the *Maisons des Sciences de l'Homme*. Certain features of the MSH are described in the report "*Pour le Développement des Sciences de l'Homme*", co-ordinated by Alain Supiot, and published in 2002. To date, eighteen MSH have been officially approved by the Ministry of Research and CNRS. Their historical growth in numbers has come in three main waves. The first one was the creation of the *Maison des Sciences de l'Homme* in Paris in the sixties-seventies. Some other similar institutions were created in the eighties (Lyon). In the early nineties, a new set of MSH emerged in a bottom-up process because they were set up by the strong will of local researchers who convinced their universities and CNRS to create this type of institution. The third wave is more recent and is inspired by the Government's aim to better distribute the MSH nation wide.

Each MSH is the result of the local history of its university and remains autonomous vis-à-vis the others. In Nantes, the MSH, its legal status, its peculiar organisation is also the result of the local history but also stems from certain permanent principles which have remained unchanged whatever the local events. This institution was created by Alain Supiot, Professor in Labour Law at the University of Nantes in 1993.

Interdisciplinary research implies a previous solid disciplinary knowledge; Interdisciplinary research must avoid any pell-mell scattering of superficial scientific knowledge. Consequently, in order to understand how it is created, it is necessary to consider the organisational consequences of the development of interdisciplinary research upon the overall structure of research within the university. The development of interdisciplinary research requires a specific structure which does not destroy the idea nor the organisation of disciplinary research. This does not mean that any reform is forbidden but it partly remains under the pressure of path dependency.

The activity of the MSH-Nantes is defined by a procedural reference to a common theme, the "*Lien Social*", that is social cohesion. This means that the MSH has not been built to become mainly a specific research centre on social cohesion, in the same way as the first type of interdisciplinary institution presented in Part III. The MSH-Nantes remains an open institution for every researcher who want to organise an interdisciplinary group of researchers for the purpose of launching any thematic scientific activity (research programmes, networking, publication, conferences, mobility of researchers, etc.). The research activity is not restricted to social fields as unemployment, social exclusion or the evaluation of social policies. This means that the range of activity can be very wide, including culture, theory of organisation, languages and linguistics, etc.

In the MSH-Nantes, interdisciplinary research is an individual and collective voluntary decision. The result is that a researcher who is hired and works on a daily basis in a primary research centre, or when he/she enters a centre in the department of his/her university, is not compelled to work on systemic interdisciplinary programmes of research. Consequently, interdisciplinary research is not necessarily a permanent task or activity. The researchers have the opportunity to move from interdisciplinary research to disciplinary research and vice versa. The system has to be flexible to manage both, permanent and non-permanent interdisciplinary research. The organisation of the second level of research has to integrate both, primary and secondary research; in other words, interdisciplinary research is not built against disciplinary research or as its replacement. The interdisciplinary institution has to be linked with the CNRS centres and the centres in the University departments. Interdisciplinary research is the dialectic result of a top-down process (e.g., the publication of a new domain of research at the national level) and a bottom-up process that is a new local organisation matching the national proposals at the local level. Interdisciplinary research supposes a system of mobility between the different organisations within which the researchers are working.

Interdisciplinary research and the activity of the researchers involved in the MSH-Nantes are agreed upon and assessed by the scientific committee of the institution in which they are conducted. The scientific committee (14 members) encompasses well-known national or international researchers from different disciplines and working in institutions outside Nantes. The scientific committee defines the general orientation of the research activities in the MSH-Nantes. Every year, the scientific committee vets the different projects of research. It obviously controls the quality of the proposals and also its interdisciplinary content. A common rule is to impose the involvement of different researchers working in at least two different disciplines and/or primary centres. After the decision of the scientific committee, the MSH-Nantes has to manage the activities pertaining to the project. Nobody can stay in the institution without a interdisciplinary project. In fact, this rule guarantees the mobility of researchers between different institutions and guarantees the efficiency of the activity of the institution

Another important feature of the MSH-Nantes is its legal status. It is not a department of the university but an autonomous institution called a "*Groupement d'Intérêt Public*" (GIP) which encompasses public institutions (University of Nantes, CNRS, the Ministry of Social Affairs, the Council of Nantes) and private institutions (*Mutuelles de* Loire Atlantique, *La Poste*, and EDF-National company of electricity). They comprise the board of the institution. This means that the activity of MSH is based not only on the scientific activity of researchers but also on the partnership between different public institutions and private companies. In addition, such co-operation provides new opportunities for the researchers.

As the other MSH in France, the MSH-Nantes is a member of the network of the MSH which was created in 2000 (see the chapter on the network of MSH).

V Concluding remarks

The main conclusion is that the development of interdisciplinary research has gradually entailed a two-tier organisation of research, a primary tier which is dominated by the disciplinary organisation largely linked with the activity of university departments and CNRS units of research. The secondary tier is at least a network of researchers or groups of researchers from different disciplines. We see that this extension of interdisciplinary research entails some institutional changes and innovation. We can imagine that in the future, the process of development of interdisciplinary research will bring about an inversion of the multilevel organisation, with the interdisciplinary research becoming the primary tier of research and the disciplinary research becoming the network of researchers and the second tier of the organisation.

Topic driven, bottom-up:
Working Principles of the ZiF (Center for Interdisciplinary Research)

Johannes Roggenhofer
Executive Secretary, ZiF

0. Summary

ZiF (*Zentrum für interdisziplinäre Forschung*/Center for Interdisciplinary Research, Bielefeld University) is a German institute for advanced study, which is open to the whole range of interdisciplinary basic research. Its operating principles and internal structure are described. Details about the main working formats offered by ZiF and the application process are given. Several examples of recent projects are considered, illustrating not only its mission and the character of its work but showing also successes and advantages as well as specific problems of the ZiF-approach to basic interdisciplinary research. Future perspectives are shortly outlined and an attempt to offer some new recommendations for a pertinent science policy is made in the concluding section.

1. ZiF Basics

ZiF (Center for Interdisciplinary Research) is a state funded institute for advanced study, which was founded as a core institute of Bielefeld university in 1968. Its principle design was laid out by the famous German sociologist Helmut Schelsky as part of his concept for the Bielefeld University founded in that same year. The Center is fully funded by the land of North-Rhine Westphalia. Funding comprises the costs for maintenance and building, the costs for the permanent staff (non-researchers, currently 20 members), for four research assistants which are temporarily employed for the research groups, and an annual budget for scientific activities of about € 750 000.

The **principal aims** of the Center are

- advancement of interdisciplinary basic research through all fields of science and the humanities
- international and interdisciplinary co-operation and exchange across the boundaries of established academic disciplines
- teamwork of fellows temporarily residential at the ZiF

These aims correspond to six characteristics or **working principles**, which also function as criteria for the evaluation and choice of proposed scientific projects:

- interdisciplinarity
- internationality
- bottom-up generation of new projects by open proposals from the scientific community
- scientific excellence of the proposed projects
- topics first, persons will follow
- co-operation of fellows residential at the ZiF

In order to fulfil its mission, the ZiF uses mainly two **working formats**, namely

- *Forschungsgruppen* (research groups) and
- *Arbeitsgemeinschaften* (workshops)

Both expressions are used as technical terms, where *Forschungsgruppe* indicates any one-year-research group with usually between 15 and 25 residential fellows, and *Arbeitsgemeinschaft* denotes any short-term workshop, usually lasting between 2 and 5 days and counting between 10 and 80 participants.

Ample **conference and housing facilities** are disposed of by the Center, which is situated on the northern slope of the Teutoburg Forest, a few minutes walk off the university main building in the western part of Bielefeld. ZiF offers several conference rooms (ranging from 10-person-units to a 190-person auditorium), 40 apartments of different sizes for fellows, library, computer pools, cafeteria, indoor pool and recreation area. All apartments have full internet access, fellows may use the full range of the university's electronic facilities.

The ZiF is managed by the **Board of Directors** (*Direktorium*) which consists of four professors of Bielefeld University, elected by the Academic Senate for 4 years (one re-election allowed) + the executive secretary + the head of administration. The executive secretary and the head of administration are advisory members of the Board.

One of the professors is elected **Acting Director** *(geschäftsführender Direktor/Direktorin*) by the Board for 2 years (re-eligible as long as as she or he is a member of the Board). She or he is the highest representative of the ZiF, develops its strategic goals, and also presides at all the boards of the ZiF.

The Acting Director (as well as the other members of the Board) acquires new ZiF-projects and communicates the research goals and funding possibilities of the ZiF into the scientific community.

The Executive Secretary (*Geschäftsführer/in*) is responsible for the preparation and implementation of the decisions taken by the Board of Directors, and the recommendations given by the Advisory Council and the Board of Trustees. She or he also advises applicants and scientific organisers of ZiF projects in matters of the selection process as well as during the realisation of projects granted. Together with the head of the administration (*Verwaltungsleiter/in*) she or he takes care of the operational infrastructure of the ZiF.

The **Scientific Advisory Council** (*Wissenschaftlicher Beirat*) consists of 16 members (outstanding scientists) of different disciplines, which are elected by the Academic Senate of the university for 4 years (re-eligible) + vice-rector for research. The Council advises the Board of Directors in all principal matters of ZiF's research policy and – after a hearing with the applicants - they give recommendations to the Board of Directors as to the research group proposals.

The **Board of Trustees** (*Kuratorium*) consists of up to 16 members mostly from commerce and industry, politics, and the media, which are by half elected by the Academic Senate and by half co-opted by the *Kuratorium* itself + the *Rektor* (vice-chancellor) of the university. The Board of Trustees is an important link between ZiF and the public life and advises on principal matters of strategic and financial development.

Beside the **scientific publications** that result from the ZiF-projects and the media reports on or out of ZiF-activities, ZiF informs about its work in the quarterly newsletter ***ZiF: Mitteilungen***. Condensed information is to be found in **5-year-books**. Most information about the ZiF, its structure, research options, the application process and its activities are now also to be found in the web: **www.uni-bielefeld.de/ZiF** (German and English versions).

2. Structures and strategies for supporting interdisciplinary research

ZiF is open for applications from all fields by scholars and scientists all over the world. The application must propose an interdisciplinary question or subject worthwhile treatment by short-term-workshops ("Arbeitsgemeinschaften") or one-year research groups ("Forschungsgruppen"). Applicants must also specify

preferred participants in their project. All proposals are externally refereed. The Board of Directors decides on all applications. Proposals for research groups must also pass the Scientific Council with a positive vote before the final decision.

In general, ZiF does not issue any calls for certain topics of research, but each scientist or group of scientists is free to propose a subject of his/her or their own choice. The proposed topic has to convince the external experts, the board of directors and – in case of research groups - the Scientific Council. Thus ZiF works bottom-up and topic-driven in the generation and selection of new projects.

Bottom-up generation of projects keeps ZiF open for new and innovative developments within the scientific community even beyond mainstream research and pays respect to the general unpredictability of scientific progress and of the rise and fall of social demands. As an institute for advanced study, ZiF allows social relevance to grow from within its projects, not imposing it from the beginning. It is primarily the scientific topic and not external factors which should guide the research work at ZiF.

Topic orientation also secures a high level of research interaction between fellows even from different disciplines and cuts short the time needed for mutual understanding (which is decisive for the short-term workshops). Within the research groups, high level interaction is further enhanced by the principle of co-residence. Fellows live and work together at ZiF: this gives room for discussions which lead far beyond what is possible during ordinary conferences and meetings. Entirely unorthodox perspectives on a scientific problem or method can and often must be taken under the pressure of being confronted with another discipline's view. Turning this pressure into a constructive force rather than an impulse to the generation of aggressive defence strategies is a prominent feature of ZiF's research groups. This turn can only work, if disciplines are respected as the legitimate consequence of division of labour and specialisation within the sciences and humanities. ZiF opts for interdisciplinarity (in MUSCIPOLIs technical sense), but accepts multi-disciplinarity as its necessary prerequisite. Interdisciplinarity in the strict sense is seen to evolve out of multidisciplinarity by teamwork and personal interaction of researchers.

Taking topic orientation and bottom-up generation of ZiF projects as working principles, the Center follows an **active strategy for the acquisition of new projects**, esp. research groups. The Board of Directors, the members of the Scientific Advisory Council, but also speakers and fellows of former research groups function as disseminators into their respective disciplinary environments. They watch out for researchers of excellent scientific standing and interdisciplinary ambition and draw their attention to ZiF's aims and resources. If it turns out that a promising topic can be proposed by the addressee, a workshop may be useful to see whether the topic is apt for a research group.

With the ongoing implementation of a **ZiF-network of younger scientists** (starting two years ago), the Center systematically increases its efforts to come into early relations with the rising generation. Interdisciplinarity needs not only disciplinary excellence and general open-mindedness, but also a sort of – at least temporary – detachment from one's own discipline which is difficult to find in the rising generation, because a younger scientist has still to strive for a firm standing in her or his own scientific peer group. But as the ZiF wants actively to propagate interdisciplinarity within the scientific community, there is no alternative to close contacts with the young generation. Practice is the best teacher also for interdisciplinarity, and therefore younger scientists are strongly encouraged to propose projects to the Center.

The **basic working formats** of *Forschungsgruppe* (research group) and *Arbeitsgemeinschaft* (workshop) evolved in the very first years of the ZiF. As a matter of practice, they are handled with great flexibility as to their formal definition. Every topic and every research project may also have its peculiarities which lead to a broad range of possible realisations of the abstract principles. Without this flexibility the openness for all fields of research could not be maintained.

Research groups are one-year projects assembling 15-25 **fellows** in the ZiF for residential research on the chosen subject. Surrounding the research year, the project is granted a year of preparation and a year of ”postediting”, where a full-time assistant researcher is financed by the ZiF. Preparatory meetings and workshops as well as editorial meeting may be funded by the Center. During the research year, a grossly varying number of **corresponding fellows** is integrated into the research work by shorter stays at ZiF. Usually, one research group per academic year (October – August) is realised.

Though fellows are not obliged to any lectures, customarily some public lectures, the **ZiF-Colloquia** (*ZiF-Kolloquien*), are arranged by each research group, where central problems are explained to a broad audience by leading experts.

Complementary to the research groups, **workshops and conferences** (*Arbeitsgemeinschaften*) are short-term activities (2-5 days) gathering between 10 and 80 researchers from various disciplines for intensive discussion and co-operation. On the average, 20-25 such *Arbeitsgemeinschaften* are realised per year, which bring more than 750 scholars to the Center. A special form of a ZiF-workshop is the **honorary colloquium** (*Autorenkolloquien*): a scholar who has significantly influenced at least two disciplines by his works discusses his lifetime achievement or more particular aspects of his oeuvre with an interdisciplinary group of experts.

In addition, ZiF realises six **art exhibitions** per year. If possible, exhibitions are directly connected to research activities. Art is considered as another form of *Welterschließung* (world disclosure), different from science in its expressiveness, in the ways its creativity works, in its products, and its reception, yet alike in its search for a deeper understanding of the world and the human condition. The momentum of transgression which is indispensable for interdisciplinary research is intrinsic to modern art. Its realisation is a prominent criterion in the selection of the exhibitions. ZiF’s art exhibitions are open to the public.

A new working format has been initiated within the last year that is intended to bridge the gap between short-term and long-term projects, between workshops and research groups. The ZiF-**task forces** (*Kooperationsgruppen*) are topic-oriented, interdisciplinary research-groups including Bielefeld and non-Bielefeld researchers. The task forces may complement already existing disciplinary research units with one or more interdisciplinary aspects. They also will meet with the need for shorter residential periods of researchers who do their daily work in the empirical, experimental or applied sciences and often simply cannot leave their home labs or investigations for a whole year. Task forces, therefore, range from 3 weeks to 6 months (a full German semester), fellows can be resident in Bielefeld for the whole duration, but may also participate with several intermittent stays at the ZiF.

3. Examples from recent years

3.1 Research Groups

Already the titles of the recent research groups (1998-2003) hint at the broad range of scientific investigation:

General Theory of Information Transfer and Combinatorics (2002/2003; Scientific Organiser: Rudolf Ahlswede, Bielefeld) is strongly rooted in mathematics and informatics, but spreads out to biology, linguistics, physics, and engineering.

Procedural Approaches to Conflict Resolution: Designing Analytical Support for Interactive Group Decision Making (2001/2002; Scientific Organiser: Matthias Raith, Magdeburg and Bielefeld) brings together game theory, economics, psychology, and practitioners from mediation.

The Sciences of Complexity: From Mathematics to Technology to a Sustainable World (2000/2001; Scientific Organisers: Ricardo Lima, Marseille/Rui Vilela Mendes, Lisbon/Philippe Blanchard and Ludwig Streit, Bielefeld) covered the whole range of the application of complexity theory and brought more than 180 fellows and corresponding fellows to the ZiF during the research year.

Making Choices (1999/2000; Scientific Organisers: Werner Güth, Berlin/Joachim Frohn, Bielefeld/Hartmut Kliemt, Duisburg/Reinhart Selten, Königswinter) comprised economics, philosophy, social psychology, and game theory. Not only the ”rational choice-model” in economics was seriously criticised and modified, but e.g. also problems like the just allocation of organs for transplantations were intensively dealt with.

Rationale Umweltpolitik - Rationales Umweltrecht (”Rational environmental politics - rational environmental law”; 1998/99; Scientific Organiser: Gertrude Lübbe-Wolff, Bielefeld) integrated political sciences and jurisprudence, and initiated a lively debate on juridical instruments for rational environmental politics. The participation of an eminent Russian researcher, Olga Doubovik, led to the effect that the results of the research group gave almost immediately a massive impact on the current reform of Russian environmental law.

From the point of view of scientific success, research groups have proved to be a most efficient instrument of implementing interdisciplinary research work. The central task in the preparation of a research group is the recruitment of the fellows. Two tendencies can be observed:

First, if some few renowned scientists have already consented to join the group, it is much easier to have others join as well. Thus scientific organisers are advised to get a few ”big names” on the fellow list quite from the beginning.

Second, it becomes increasingly difficult to recruit a larger number of long-term fellows who stay for 9 to 11 months at the ZiF. The flexibility of professors has in that respect greatly diminished since the days of Helmut Schelsky. The more ZiF ventures forward into empirical, experimental, and even applied sciences, the more pressing have become problems concerning long-term fellowships. It was therefore inevitable to handle the period of residence of a fellow with more flexibility. Another consequence is the new working format ”ZiF-task force”.

It would be futile trying to repress these problems, to the contrary, they have to be met with actively. The ways of advancing interdisciplinary research have to be adapted to the changed conditions within the academia.

3.2 Workshops

An equally broad range of topics can be found in ZiF’s workshops which cover all dimensions of the sciences and the humanities, as a sample of the workshops in May/June 2002 may suffice to show.

14. - 15. May	Fakten statt Normen? Zur Rolle einzelwissenschaftlicher Argumente in einer naturalistischen Ethik (“Facts instead of Norms? The Role of Arguments from Particular Sciences in Naturalistic Ethics”; G. Vollmer, Braunschweig, K. Homann, München, Ch. Lütge, München)
23. - 25. May	Transformations of the 'Public Sphere' in the Age of the Global 'Network Society' (I. Volkmer, Cambridge, Mass.)
6. - 9. June	SocioPhysics (F. Schweitzer, St. Augustin, K.G. Troitzsch, Koblenz)
20. - 21. June	Perception and Representation of Science in Literature and Fiction Film (P. Weingart, Bielefeld, P. Pansegrau, Bielefeld)

24. - 27. June Modeling of Complex Systems. New Perspectives in Mathematics, Physics and Biology (S. Albeverio, Bonn, Prof. R. Figari, Neapel, et. al.)
28. - 29. June Kunst, Geschlecht, Politik, Männlichkeitskonstruktionen in der Moderne ("Art, Gender, Politics - Constructions of Maleness in the Modern Age"; M. Kessel, Bielefeld)

To the experience of ZiF, there is a slight tendency, especially in the natural sciences, to have bigger conferences with different sections and poster sessions instead of small workshops. ZiF aims at retaining the communicative "workshop character" throughout: the strong interaction of all participants is the firm basis for a truly interdisciplinary communication.

3.3 Honorary Colloquia

Among the scholars who visited the ZiF on the occasion of a honorary colloquium figure Arthur C. Danto, Joseph Raz, John R. Searle, Amartya Sen, Michael Theunissen, Michael Walzer, and Harald Weinrich - to name but a few. The scholars central to a honorary colloquium usually give a public lecture during the course of the colloquium.

To sum up this short glance through ZiF's activities, it can be held for certain that the basic working principle of bottom-up generated topic-orientation proves as an enormous advantage in the advancement of interdisciplinary research. It gives clear and operational criteria for the selection and recruitment of fellows and makes it much easier to surmount the typical problems of interdisciplinary co-operation like the mutual misunderstanding of technically used terms and a certain deliberate neglect of other disciplines' views. With regard to the long-term development of science it is quite clear that the implementation of new disciplines can be most successfully started with international interdisciplinary research groups where each fellow functions as an important disseminator within her or his home community.

4. Future perspectives

The next goals in ZiF's further development can be very shortly summarised.

The principal aim is to retain the advantages of interdisciplinary teamwork by residential fellows which can fully enjoy freedom from the usual treadmill of academic life and obligations. To this end, a solid funding by the state is without alternative in Germany, where private foundations will continue to play a regrettably minor role for at least another decade.

Topic-oriented generation and selection of new projects proves to be a most profitable working principle for the Center's activities. Yet, ZiF is changing in a changing academic surrounding. It is necessary to increase flexibility with regard both to project forms and fellowship terms. Still more time and manpower must be invested in the identification of promising topics and persons. This will finally lead to a further increase in the number and quality of applications.

More network-structures throughout the scientific community must be built up which secure a constantly renewed input to the ZiF. These network structures should comprise both senior and junior scientists, which are indispensable not only as applicants and fellows, but also as referees and informers on new and coming scientific developments.

On a more operational level, an important step into more flexibility will be undertaken by experimenting with the new form of ZiF-task forces (*Kooperationsgruppen*). If this format proves to be an adequate answer for a serious demand, it should be widened with respect to applicants (allowing also for projects without Bielefeld-researchers as organisers) and with duration (allowing also for intermittent projects of more than 6 months).

5. Some recommendations for a pertinent science policy

The greatest challenge when it comes to thinking about what demands could be made on a pertinent European science policy for interdisciplinary research, is the resistance to all kinds of over-management in science. Undoubtedly, there are a lot of problems like climate change and its effects on production, commerce, and habitability, the challenges of the ageing societies, or traffic flow in metropolitan areas. For all such problems society rightfully expects advice and solutions from the sciences. It goes without saying that research in such fields should be encouraged and even demanded by the state. Yet, scientific progress does not result only from these demands, but often roots in considerations and in scholarly curiosity (yet) far from being publicly demanded. It is an important duty of the European states not to neglect pure research in a mistaken favour of application-oriented development. Here is a field where clearly the perspective of the states must be larger than the perspective of industry and commerce. To my opinion, it is advisable that especially smaller-scale interdisciplinary research institutes (like institutes for advanced study) should pursue a common policy in this respect. Co-operation between institutes is not so much needed on the level of research topics, but on the level of research policy. It would be of little use, if these institutes would agree on the topics which they would deal with in the next years (as another case of ”mergemania”), but it would be a great help indeed, if they could persuade the governments and the European authorities of the necessity to maintain a highly decentralised research infrastructures.

Only there, the bottom-up principle of project generation and selection can function as a *nucleus* for innovation in science beyond the mainstream. The division of labour within academia provides a special role for institutes for interdisciplinary advanced study. Taking the ZiF as an example, it is obvious that it works not as a think tank, but much more as a think lab, where ideas are not generated under the pressure of external demands, but where there exists the freedom to play on ideas just for scientific and personal curiosity. This must not be considered as a squandering of taxpayer’s money, but as the necessary venture investment for future scientific progress, which in turn is necessary for the satisfaction of hitherto unknown social demands.

A second recommendation aims at the changing situation for researchers. Throughout Europe (and beyond) it is a common practice to grant sabbaticals to university researchers, also in the industry sabbaticals for researchers (and many other creative workers) become more and more common. Up to now, sabbaticals are generally used in an individualistic way, leaving it entirely to the single researcher what to do with her or his spare time. It should be considered whether something like ”teamwork sabbaticals” could be supported by the EU, where researchers from different EU countries and also different disciplinary background could apply for a common working sabbatical. The exchange programs and guest-professorships now common often suffer from the high load with academic duties both of the host and the guest. Teamwork sabbaticals would offer the chance to do common research work under optimal working conditions and could almost automatically secure an intensive interaction between researchers from different countries and with different scientific background. This could be considered as a further step towards an integrated European research landscape.

Breeding Zones for Conceptual Change

Joachim Nettelbeck
Secretary of the Wissenschaftskolleg Berlin, Institute for Advanced Studies

Institutes for Advanced Study (IAS)

There is no need to give a lecture to describe the Wissenschaftskolleg. It is just an Institute for Advanced Study, which invites 40 fellows to pursue the work of their own choice during one year of residence in Berlin. I prefer to talk about the question, why such Institutes are necessary elements of the system of research and higher education. By this I try to relate back to the general topic of the conference "Managing with uncertainty in science policy". In fact, besides providing time and concentration for an intensive research phase Institutes for Advanced Study fulfil a compensatory function in addressing especially the aim of planning for the unforeseen. This aim makes only sense, if it is seen in the context of a large and diversified system of research and higher education. The effect of such institutes is particularly fruitful at certain stages of research, especially in developing new research designs or synthesis, and for certain fields, fuzzy and in need of cooperation, when inspirations from other disciplines and cultures of science are enriching the perspectives. In this sense they presuppose that there are programs, projects, specialized research institutions and Universities with disciplinary structures. They allow an evasion from these structures for a limited time to enlarge the horizons of ones own work working alone or in cooperation with other fellows. The expectation is that this particular opportunity allows for conceptual innovation, supports creativity. I call this breeding zones alluding to the Trading Zones of Peter Gallison, because this phase needs a common place, comfortable conditions and precedes more institutional structures. The Institutes for Advanced Study allow for this kind of conceptual change, but can't foresee its results. That is why the only way to promote this function is to choose the right persons and to create an institutional setting, for a limited time, supporting the cross-fertilisation between the fellows.

You will have noticed that I did not mention inter- or multi- or pluri-disciplinarity. I consider that these are terms of science policy, which have been very successful and that is why it is no more worthwhile mentioning them. Looking at research objects from different disciplinary perspectives has become a very normal way of doing research. The difficult cleavages of scholarship nowadays are within disciplines between models on the one side and narratives on the other side. The term interdisciplinarity moreover created illusions about the continued importance and necessity of disciplinary structures. Institutions and programs could become easily marginalized if they did not respect sufficiently the fact that scholars make their careers within disciplines. Area studies provide a good example for these problems. However, it goes without saying that the work of each scholar can be enriched by taking into account the way how similar questions are treated in other disciplines. And under the conditions of globalisation it becomes more and more evident how important comparisons between different cultures can be, an under-exploited domain of inspiration in my view. In this sense Institutes for Advanced Study are institutions where the presence of other cultural perspectives and other disciplines foster conceptual change. This is what I would call soft interdisciplinarity or interculturality.

If there is no program to ensure the success and allow for evaluating the result of research funding, the decision makers have to trust into persons and in the institutional setting. That is why selection becomes crucial. Normally, selection procedures are designed to be fair and to choose the optimal persons. If an institute strives for innovation, it also has to be selective, it has to dare to be idiosyncratic. Of course it wants to be excellent. Sometimes it becomes a difficulty to be just with everybody fair because it cannot do everything. Each Institute for Advanced Study develops its own style. That is why it is very important to have a number of different such institutes providing a diversity of such breeding zones, but also a diversity of procedures with different reference peers. In order to stay open to its new fields and to develop at the same

time a recognizable style, it is essential to have academic advisory boards which cooperate with the directors in a way that this dialectic between stability and openness is continuously maintained.

As to the institutional setting I only want to mention some general elements. However, it is most important that there are diverse institutions profiting from the particular opportunities of a given academic milieu. A fundamental requirement for its innovative function is that the institution gives entire freedom to its scholars and tries to be as supportive as possible – in the sense of comfort so that the scholar can really concentrate on his work, but also in the intellectual sense avoiding to impose an agenda of the institution. This presupposes of course a flexible budget. The internal rituals of the institutions should allow for community building because learning from scholars in different fields is not only an intellectual question but also a personal relationship which builds on personal trust. Common meals are very functional for community building. However, just because you have to emphasize the community aspect it is also important to have at the same time arrangements which allow for openness towards other perspectives, the practical world included. Finally I want to mention an aspect which is to a certain extent a particularity of the Wissenschaftskolleg. If from the perspective of the research system it is expected that conceptual changes emerging from the Institutes for Advanced Study will influence other institutions or situations, the leadership has to think about embedding an Institute for Advanced Study, it its constitutional context, its link to the local universities and to the research organisations and foundations. The Wissenschaftskolleg especially supports its former fellows if they want to develop institutional initiatives. This has been done in the last ten years especially for eastern Europe (Collegium Budapest, New Europe College, Bibliotheca Classica, Sofia Nexus).

Finally I want to mention some unsolved questions. Institutes for Advanced Study will have to response to them in the future:

1. The changing time patterns and media situations let us wonder whether such breeding zones could also develop at least partially in a virtual way within the network.

2. If the aim of the Institution is initiating conceptual change without expecting the fellows to really work it out, it becomes questionable how such processes should be published. The normal conference reports seem unsatisfactory.

3. Under the normal career patterns of most of the disciplines a stay at such a fanciful place is considered to be a waste of time for an excellent Post-doc even if the conceptual enrichment might be very important with respect to the innovation of the. What could Institutes for Advanced Study do for postdocs so that their career risk is diminished?

Institutional concepts and organisational structures for pluri-disciplinary research: The example of a Social Science Research Institute

Georg Thurn
Head of Research Policy and Coordination; Wissenschaftszentrum Berlin
(Social Science Research Centre Berlin – WZB)

1. Policy contexts and research structures

Social change takes place in a complex confluence of technological, economic, social and cultural developments and political decisions. In many cases one must take into account sociological, political, economic, psychological, juridical, and other aspects as well as their interplay. Adequate analyses must thus often go beyond the bounds of single scientific disciplines. Often they must also extend beyond the boundaries of a single country, since the conditioning factors and repercussions of social processes frequently transcend national borders. Moreover, these processes may follow similar courses in different countries. The world is thus replete with “natural” experiments that social scientists can use – with due caution in transferring the results – when working on their particular research questions.

It is such notions, demanding inter- or pluri-disciplinary orientations and cross-nationally comparative approaches, that have formed the social science research policies and guided the institutional growth of the Wissenschaftszentrum Berlin für Sozialforschung (Social Science Research Centre Berlin – WZB), making it one of the largest publicy funded research institutes in Europe. In the case of WZB, inter- or pluri-disciplinarity follows from a concept of problem-oriented research. This will be addressed in the next chapter (2.), providing the context for a summary of experiences WZB has to offer with regard to the institutional conditions – adverse as well as favourable - for “organizing” pluri-disciplinarity (3.). As background for the discussion of these issues, some aspects of the institutional philosophy of WZB and its thirty-years’ history of conceptualizing and revising institutional structures will, very roughly, be outlined in this initial chapter (1.).

The build-up of WZB as a leading research center in (West-)Germany goes back to initiatives, in the early 1970s, of the then social-liberal government, emphasizing the need for application-oriented social research relating to the tasks and problems of policy-making in Western industrial countries, with a particular accent on the transfer of research results. This was based on a strong belief in the importance of scientific knowledge and its problem-solving capacity for the development of society, combining the Enlightenment idea of progress with socio-technological reform strategies, building on a “political-philosophical” consciousness according to which scientific rationality and technological rationalization were to lay the material foundations for humane societies. From this it followed – in line with, e.g., the “Brooks Report” (“Science, Growth and Society”; OECD 1971) – that research capacities had to be increased in order to study the positive and negative consequences of technological innovations. For the WZB this meant the institutionalization of public funding (jointly by the federal government with 75% and the state government of Berlin with 25% of the expenditures) and the establishment, in quick succession, of large research units operating outside the universities, but linked to them (particularly to the two – later three – Berlin universities) in different forms of cooperation.

In the initial period, lasting from the middle of the 1970s until almost the end of the 1980s, the central elements of the institutional structure of WZB were five “Forschungsschwerpunkte”, i.e. research units which were established for a limited time of normally five years, concentrated on a policy area (e.g. Labour Market Policy, Industrial Policy, Environmental Policy etc.) and subjected to evaluation procedures in regular intervals. In such a research unit, approximately fifteen research fellows –– and in addition, a similar number of visiting professors, doctoral students and researchers financed by third party grants – worked together under one director who was responsible for the research program which he had worked out and proposed in advance to the President and the Board of Trustees. Within the limits of the program, the unit’s work was carried out in independence from the central management of the WZB; only towards the end of the five-year period did the unit again become affected be overarching decisions on future institutional priorities for the centre as a whole.

With this goal of concentrating research on societal problems and policy areas, one can, on the one hand, speak of a period of consolidation of a concept of “problem-oriented basic research” which basically is still in force today. However, with the enthusiasm of doing something rare and innovative, there came, on the other hand, an increasing awareness of structural tensions and potentially conflicting interests in relation to the major players in the traditional system of academic research and teaching: In terms of programs and personnel, the institute, operating outside of the university, developed an enormous degree of extremely flexible and fluid structures, but it lacked the longer-term prospects and stable agendas necessary to offer career perspectives to its fellows who found it increasingly difficult to bridge the gap between the functionally different research environments: moving from training in a discipline over to “interdisciplinary” work and back again to a “disciplinary” academic position as university professor.

The need to strike a delicate balance between doing something unusual, yet operating within traditionally grown system, therefore, generated an internal dynamics of structural adjustment and increasingly urgent demands for strengthening the continuity of research in longer-terms programs. This met with a new confluence of interests from the financing ministries after the change the government in 1982-1983 to a “conservative-liberal” coalition, emphasizing the need for basic research and downgrading the aspects of its practical application. This position was held on the basis of general science policy principles as well as from a certain scepticism about the philosophy of the 1970s and in particular against a type of social science research that was seen as too closely associated with “politics”. Largely independent of conceptual considerations with regard to the functionally adequate forms of organizing particular research tasks, the intentions centered on a rather general improvement of institutional conditions such that the most distinguished professors in their specific academic disciplines and respective subject areas could more easily be hired to work in Berlin. In intensive discussions it became, from the point of view of WZB, of primary importance to retain and confirm the notion of problem-oriented social science research and to secure the appropriate organizational forms. In the end, a consensus was reached on a concept for structural reform, and the charter of WZB accordingly changed in 1985.

The most important element in the discussion on the restructuring of the institution became the question of how the evolution of knowledge-oriented basic research could be supported without its falling apart into separate individual activities and disciplinary divisions, and how at the same time problem-orientation and cross-disciplinary perspectives could be strengthened. Combining conceptual and institutional aspects, this question touches upon the very *differentia specifica* of the WZB (and thus – in the Federal Republic of Germany – on the science policy justification for financing research institutes outside the universities).

The structural solution was a combination of smaller – more discipline-oriented – research units with larger – cross-disciplinary – research areas. The particular arrangements and their relevance for the institutionalization of “pluri-disciplinarity” will be addressed below (chapter 3).

As a result, the process of reconsidering the guiding principles of research led to a new formulation of the institutional self-understanding that, in the end, reflected a broad consensus. On the whole, this reform process can be taken as a confirmation of the generally relative moderate way by which in the Federal Republic of Germany – as compared to other countries, notably the U.S. and the U.K. under the Reagan administration and the Thatcher government – overall policy changes are being translated into new accentuations of (social) science policy principles and into modifications of institutional structures.

2. Problem-orientation

Social science research has become institutionalized at WZB not along the disciplinary lines of sociology, political science or economics, but with an expressed concentration on "problems". Research is to be conducted in selected problem areas of special concern to society under the general theme of "developmental tendencies, problems of adaptation, and possibilities for innovation in modern democratic societies". The focus is on the problem-solving capacities of social and governmental institutions, often with the cross-nationally comparative dimensions being emphasized so as to learn from approaches taken in other countries. The primary interest is in generating knowledge within the context of a problem area or policy field, not in designing policies or in solving problems directly.

Developing an adequate concept of problem-oriented social science research has been at the center of reform discussions (as mentioned above) and has, of course, been an ongoing concern in the three WZB decades of doing social science research in the German and European research environment, with strong links extending to North America and Japan. Drawing on insights from this – sometimes rather strenuous – experience, the possibilities and limitations of problem-oriented research have been discussed with respect to the guiding scientific concepts as well as the appropriate institutional conditions. Some of the central aspects of this continuous debate may be summarized as follows:

- Problem-oriented research as understood by the WZB holds a middle position within the spectrum of possible research concepts – situated between, on the one hand, individual research activities aiming generating scientific knowledge, as regularly conducted in the universities, and, on the other hand, commissioned research related to concrete problem-solving demands, as carried out by commercial institutes.

- Such research is basic research, relating to larger scientific context and contributing to theory-building.

- In addition to the general commitment to scientific knowledge, the question of relevance plays a role in the prior choice of the overarching research object of studying problem areas in society.

- There is certainly an expectation that the knowledge gained by such problem-oriented work may be useful for policy-making. However, this is understood not in terms of immediate application and direct practical advice, but rather in the sense of more indirect and long-term effects that make for a clarification and a deepened understanding of the problem area.

- More and more political decision-makers and advisors need to draw on continuous theoretical and empirical research in larger contexts. An independent social science research institution, therefore, should not attempt to respond to immediate demands for quick solutions; rather, their contributions should be the results of the process of collective self-criticism of a scientific community.

- The emphasis on broadly based, long-term basic research does not exclude the possibility of also working on individual projects that respond to concrete demands. On the contrary, the results of such an enterprise can be scientifically fruitful and stimulating. The decisive questions, however, will be whether

such a project can be sensibly embedded in the predefined research context and its theoretical perspectives.

- The WZB may not always have been immune to accepting restricted commissions that were, for example, offered from federal ministries, and may sometimes indeed have engaged in relatively limited projects on actual issues. In many cases (in past and present) the real problem, however, lay in having to explain to a ministerial bureaucracy interested in direct problem-solving that such requests ran contrary to their own self-declared science-policy principles which on other occasions were being invoked to emphasize the importance of basic research in larger frameworks.

- The WZB has never perceived itself as a consulting instrument for policy-makers. On the contrary it has on a number of occasions rejected opportunities which in effect would have meant some form of social-technological implementation separated from scientific knowledge interests. Nevertheless, that problem-oriented research was to be conducted in policy-fields has time and again led to misunderstandings. To some degree this has to do with the difficulty that in the German language there is only one and the same word ("Politik") for "politics" as well as for "policy". The goal has never been to do research in direct association with "politics", but rather to study problems of societal development in larger "policy" areas.

- Thus the emphasis on problem-oriented or – in other formulations – applicatioin-oriented or "policy-oriented" research does not aim at narrowly conceived policy analysis. Far from being restricted to "policies", the object areas encompass their preconditions and backgrounds in a broad social field.

3. Institutionalizing pluri-disciplinary research

Problem-oriented research by definition goes beyond the scientific access offered by a single discipline. The structure of teaching and research at the universities, however, often makes it difficult to work on themes that transcend the boundaries of an individual department or chair. It can therefore be seen as particular challenge for institutes outside of the universities to develop innovative institutional arrangements in order to bring together perspectives and persons for inter- or pluri-disciplinary approaches.

In this regard, some lessons learned from WZB experiences may be summarized as follows:

- Inter- or pluri-disciplinary research – as well as internationally comparative work – serves an important function in broadening the empirical basis and revising theoretical constructs. In terms of methodology and organizational requirements, such research projects often are particularly demanding and call for institutional conditions that usually are not available in the universities.

- Opinions may differ on the conceptual and pragmatic possibilities and limitations of inter- or pluri-disciplinary (and similarly of internationally comparative) research. Those who, being convinced of the potential advantages, put a particular accent on these dimensions will have to be mindful of securing adequate organizational forms, particularly with respect to time frames and personnel qualifications. Without lowering quality standards, such projects cannot be initiated or changed on short notice.

- Policy consulting may often be directly assisted by the interpretation of existing, and the generation of new, data sets. Basic research, however, will have to adapt and address itself to existing theoretical approaches which may then be further developed or replaced by better ones. To this end it is important that interdisciplinary projects are oriented at adequately designed theoretical constructs and broader scientific perspectives; at the same time, an emphasis must be put on intensifying the connections and interchanges with theory formation in the individual disciplines.

- Progress in theory-building can not so much be expected from a single project as from the results of a systematic research enterprise carried on continuously over a longer period of time, widening the basis for reacting flexibly to instances of success and disappointment. This is all the more true for institutions devoted to inter- or pluri-disciplinary (and internationally comparative) research in broad problem areas.

- Research fellows in a problem-oriented research unit will find that their success depends not only on the integration of their work into the overarching research program, but also in the recognition of their achievements by an external peer group. This tension between inward and outward orientation will be stronger the more the type of research undertaken in a given institution deviates from “normal” research done elsewhere.

- In a large research unit the need for “research management” can be so demanding that the possibilities for the responsible director to personally participate in the scientific work might become narrowly limited.

The aspects mentioned in the last two paragraphs – career perspectives and management capacities – had been important driving forces in the push for reforming the internal structures of WZB. In the original set-up (“model 1”), interdisciplinarity or – in the WZB language of the time – “multi-disciplinarity” had been organized by creating large unitary, “monocratically” directed research units, bringing together researchers from different disciplines to work on a cross-disciplinary, problem-oriented research agenda. This, however, while making for productive research with novel approaches on interesting themes, did, in the course of time, prove rather costly in terms of the award structures and other functionalities within the academic research system. As a consequence of practical experience with this type of “interdisciplinarity”, it became a matter of increasing urgency to find institutional structures that would narrow the gaps and ease the tensions between this “new” type of research and the “old” environment.

The solution, then, was a new institutional set-up (“model 2”), still in operation today. This provides a more complex structure with, on the one hand, a greater number and variety of smaller research units (of four to six researchers plus visiting fellows, doctoral students and researchers on third-party-grants etc., working under a director who, by joint appointment, is a full professor – with a reduced teaching load – at one of the Berlin universities); these units incorporate theoretical-conceptual perspectives growing out of the different social science disciplines. The smaller units are, on the other hand, brought to bear on a larger research area (“Forschungsschwerpunkt”), the different dimensions of which can thus be studied from different theoretical points of view and with the expectation of additional synergetic effects. Through the interlocking of smaller units, representing (disciplinary) perspectives, with a more encompassing framework, representing the (interdisciplinary) dimensions of a problem area, model 2 is meant to bridge the “systemic gap” with the academic environment by facilitating the transitions to and from the universities, while at the same time retaining problem-orientation and pluri-disciplinary perspectives.

An important issue of research management, which is of particular relevance in a multi-layered structure like “model 2”, is the question of the appropriate ways of deciding about the thematic (theoretical, disciplinary) directions and the (cross-disciplinary) interplay between the different units expected to cooperate in a given problem area. In matters of thematic orientation, the discussion often centers on the crucial question whether a research institution in the first place ought to decide on a specific thematic area or a particular theoretical-methodological approach, or whether, independent of such considerations, it would be more important first to identify the most prominent representatives of the respective disciplines concerned, with the intention of hiring the most “excellent” authority. The solution found for the WZB attempts to combine these two aspects of “programs” and “persons” in the task of the so-called “Thematic Orientation and Search Commissions”. Ideally, a wide and relatively open definition of the thematic area would serve as a basis for identifying possible candidates who would then be invited to present and discuss the perspectives of their intended research so that the thematic directions of a future research unit could be more concretely clarified, defined

and modified in a dialogue between interested scientists and commission members. In such a process, moreover, the adequate composition of a research institute or a larger research area with different smaller units, from whom a coordination of research activities would be expected, can be discussed with a view to favourable combinations of themes and persons, of cross-disciplinary complementarities and potential synergies.

In comparison, model 2 certainly is the less clear-cut, more complex alternative, requiring organizational safeguards and institutional sensitivities to a much greater degree than model 1 with its interdisciplinary research units. Model 2 had been constructed not so much in opposition to, but rather in complementarity with the traditionally grown research system. The challenges, drawbacks, in-built conflicts as well as benefits and opportunities associated with this model should be discussed on some other occasion, preferably in comparison to similar or competing institutional structures in different research settings. To conclude this exercise in the context of the Muscipoli project, it may even be in conceptual and epistemological terms that model 2 should be regarded the more appropriate solution. In terms of the adequate institutional structures, model 2 – while less emphatic, but certainly more realistic – appears to be a viable form for the institutional realization of inter- or (better:) pluri-disciplinarity in a research institution.

The Hanse Institute for Advanced Study

Ingeborg Mehser
Hanse Institute for Advanced Study (Delmenhorst)

The Hanse Institute for Advanced Study (HWK) was founded in 1995 and began its full-scale activities in the new Institute building in summer 1998. It is a non-profit private foundation of the German states of Lower Saxony and Bremen and the city of Delmenhorst. The Institute is located in the city of Delmenhorst between the Hanseatic City of Bremen and Oldenburg in Lower Saxony.

The first considerations for the founding of an Institute for Advanced Study in the northwestern region of Germany go back to at least 1991. Before its establishment long debates proceded over its scientific and political value. Finally a memorandum from May 1994 gave recommendations for the establishment of a Hanse Institute for Advanced Study.

Prof. Dr.Dr. Gerhard Roth, a neurobiogist at the University of Bremen, was nominated in 1996 by the search committee appointed by the founders for an initial ten-year term. His administration has extensive organizational and creative means at his disposal, which should serve to develop an independent profile for the HWK and to allow for experimentation with innovative concepts.

Objective

The main objective of the Institute consists in the strengthening of the regionally, nationally and internationally recognized research potential of the universities and research institutions in the area, in particular the University of Bremen and the University of Oldenburg. The HWK nevertheless remains independent of these institutions in its decision-making processes and is not subject to their instructions. In cooperation with these universities and non-university research institutions in the area, the HWK supports the disciplinary and interdisciplinary collaboration of especially qualified scholars and scientists on both the national and the international levels. A strong emphasis is placed on the support of junior scholars and scientists. Beyond that, the HWK strives to increase the attractiveness of the region for the settlement of additional scientific and academic institutions and scientifically oriented private enterprise.

Concept

The concept of the Hanse Institute is modelled after the prestigious Institutes for Advanced Study in Princeton, Stanford and Berlin. Similar to these institutes, the Hanse Institute invites fellows to Delmenhorst for three to ten months both to pursue research projects and to enjoy the opportunities for academic and personal exchange provided by a residential community and numerous Institute events. A total of twenty-one apartments are available in the Institute building of the HWK.

At most of the Institutes for Advanced Study, fellows predominately work independently of the faculties and institutes of the local or regional universities. By contrast, it is intrinsic to the work of the HWK that fellows be selected for their capacity to work together with colleagues at the nationally and internationally esteemed research centres of the University of Bremen and the University of Oldenburg. HWK fellows are not chiefly theorists; instead, they are active in practice and experimentation within the laboratory and other facilities in the neighboring research institutes. The fellows also can take part in instruction there on a limited basis. To the extent that the focus of their research allows, fellows can also work with additional renowned research

centers in northern Germany, including the Universities of Bielefeld, Bochum, Hamburg, Hanover, Magdeburg, Munster, or Osnabruck.

An additional emphasis of activities at the HWK is organizing and holding academic conferences and workshops. The topics of these meetings stem both from the Institute's three main research areas and from interdisciplinary issues of current and future interest.

Areas of Work Emphases

Comparable institutions such as the Berliner Wissenschaftskolleg (Berlin Institute for Advanced Study), the Zentrum für interdisziplinäre Forschung (Zif; Center for Interdisciplinary Research) in Bielefeld, or the Netherlands Institute for Advanced Study in the Humanities and Social Sciences (NIAS) in Wassenaar, place their emphases on the humanities, the social sciences and history. The HWK, too, has a social science emphasis, but also concentrates on issues from the natural sciences.

For the first ten years, three areas of research have been selected which are particularly strong in northwestern Germany: cognitive neurosciences, oceanography and climate research, and social sciences. The fellows will work primarily with those research institutions at the University of Bremen and the University of Oldenburg at which a "critical mass" of research staff already has been achieved, including scholars and scientists with national and international reputations.

Determinants of Human Behavior

In addition to the research areas listed above, the HWK houses a long-term research program initiated by the Director, Professor Dr. Dr. Gerhard Roth, a neurobiologist at the University of Bremen. It is entitled "Determinanten menschlichen Verhaltens" ("Determinants of Human Behavior"), with the self-proclaimed objective of building bridges between the natural and biological sciences on the one hand and the humanities and social sciences on the other. Hand in hand with this objective, the work of this program aims to answer a question whose central scientific and social-political importance is quite evident: Why do the personality and the character of an individual consolidate so early in life? And why are they thus ever more difficult to influence in later life through environment, education, individual experience or even through psychotherapeutic processes?

The question of who or what determines human behaviour is the most important question we can ask ourselves. The answers to this question, as is known, diverge widely: the activity of a higher being (God, a world spirit, fate), social forces superior to the individual, short- and long-term environmental influences, conscious individual planning, unconscious drives, our genes – these are some of the factors believed to determine our behaviour either alone or in combination with other factors. A halfway certain answer would be of the utmost importance for practically all spheres of life, for instance for the questions:

- How optimistic or pessimistic may/should one be when striving to change human behaviour, be it through raising children, eliminating "divergent" or undesired behaviour, or in the course of realizing social change?
- Is a human being what he makes of himself, or is he the plaything of his unconscious, his genes or the influences prevailing in his environment?
- To what degree is a human being at all responsible for his conduct? This then raises the question of free will and both the moral-ethical and the legal dimensions of human behaviour.

Setting aside all clearly religious or political convictions and restricting oneself to the arguments and points of view expressed by the scientific community, it is apparent not only that a great many sciences, from biology all the way to the social sciences, assert that they are chiefly or exclusively responsible for this topic; it is also clear that within each of these sciences great, often bitter dissension rages about the answer. In this context it seems appropriate to point out the historical antagonisms among disciplines and sub-disciplines, the high degree to which supposedly objective sciences are penetrated by basic personal convictions, methodological or object-specific restrictions in the various disciplines, the high social relevance of the findings and points of view expressed, and the sciences' dependence on social acceptance – accepting this situation with resignation is not an inevitable result.

The point of departure for the research program outlined here is the observation that each of the relevant sciences, be it behavioural genetics, neurobiology/brain research, ethology, cognitive psychology, developmental psychology, social psychology, psychiatry, psychotherapy/psychoanalysis, anthropology, ethnology, economics or political science (to name just a few disciplines), yields many findings which are considered to be more or less certain within the given discipline, but which are unknown or not taken into consideration (for whatever reasons) in the other disciplines. Thus representatives of one discipline often use arguments that have been dismissed by representatives of another discipline as "empirically disproved decades ago". Discourse among the disciplines relevant to the current objective is rare; occasionally open strife prevails. The situation might not matter to us at all did it not concern an issue which is so meaningful to us in every respect.

In the "Determinants of Human Behaviour" program we do not expect to find any ultimate answers in the medium term. Much would be accomplished if the relevant disciplines would initially find ways to facilitate mutual conversations, and do so without any obligation to reach agreement. Many have experienced upon similar occasions that it the main reason the participants do not understand each other is that they do not know the methodological and objective possibilities and restrictions of the other fields and, moreover, do not know anything about the actual issues in the other fields. Many "great minds" of the past remain foreign to us because we do not (any more) know the elementary problems with which they were concerned. Much would be gained if representatives of the participating disciplines would, where possible, in connection with concrete objectives, begin to develop a sense of what constitutes the problem horizons and the argumentative points of departure of the other disciplines. The intention is to achieve a minimal "consensual area", also on the statements about which there is definitively *no* agreement.

Art and Science Laboratory

The goals of the HWK include the promotion of a dialog between art and the sciences. This goal is to be viewed in the context of its interdisciplinary claim to cross the borders between the different sciences as well as to open the sciences themselves to external influences, and to art in particular. For this purpose the "Art and Science Laboratory" will be established at the HWK, initially for three years.

The fellows from the field of art are to advance the dialog between art and the sciences together with the resident fellows from the field of science. The dialog is to be initiated through the artistic fellows introducing their work at the beginning of their residence and subsequently participating in regular workshop discussions.

This laboratory is to become a field of experimentation of fruitful debates between the natural and social sciences on the one hand and artists on the other. It is intended to inspire the artists to produce works which then will remain on the premises of the institute. The prerequisite for the appointment of an artist at the HWK is that the field of science is not completely foreign to the artist and that the artist is willing to actively overcome fears of contact and points of friction with the sciences. The ideal appointee would be a scientist who is (also) an artist or the artist who has (also) become a scientist.

The HWK is well equipped to promote the dialog between art and the sciences, as it already has gained years of experience as an institution with scholars from different disciplines living together, working together and enjoying mutual intellectual confrontations. These experiences are to be expanded to the sphere of art with the “Art and Science” project. The obligatory residence at the Institute also presents fellows with the opportunity to become better acquainted with each other personally. This makes a more intensive interdisciplinary exchange of ideas than would be possible in an academic setting. These favorable pre-conditions at the HWK can also stimulate the discourse between artists and scientists.

The HWK is guided in its initiative by the consideration that the points at which current science and contemporary art confront each other are more numerous than generally assumed. Numerous artists of the younger generation today have enjoyed a broadly based academic education. Interdisciplinary thought, the deliberate incorporation of a wide range of thoughts and theorems from different fields of science and spheres of life, has become second nature to this generation. Conversely, the HWK hopes that its fellows from the sciences also will find impulses for their work. The strong interest many scientists always have shown in art often has led to activities outside their fields. The HWK initiative continues in this tradition. Furthermore there are thematic points of contact, in the fields of neuroscience and cognitive science, for instance. As just one example, consider the neurological and psychiatric disorders like agnosia and schizophrenia with their changes to the worlds of perception, experience and emotion, which many artists have productively incorporated into their work.

Future Objectives

In addition to the appointment of individual fellows who work on their subjects in close collaboration with working groups at regional universities and research institutions, in the future groups of researchers will be established for each of the three subject areas at the Hanse Institute for Advanced Study as well as for its long-term research program “Determinants of Human Behaviour”. The purpose of these groups is to work together intensively on research topics of high current interest in order to provide new stimuli for research in the northwest region of Germany. This work may be performed in collaboration with scientists at regional universities and/or research institutions. The groups of researchers should comprise either three fellows whose residences at the Hanse Institute for Advanced Study overlap for a maximum of ten months, or a larger group of fellows with proportionately reduced, partially overlapping residences at the Institute. A maximum of two groups of researchers will be established for each year, totaling no more than thirty fellow-months. The groups should be composed chiefly of junior scientists. The groups will be prepared and taken care of by a “senior scientist” (or a scientific board) who is either directly integrated into the group’s work, or who takes care of this work “from afar” and through occasional visits to the Institute.

A New Vision of the World — Transdisciplinarity

Basarab Nicolescu
Theoretical Physicist at CNRS, University of Paris 6
Member of the Romanian Academy
President of the International Center for Transdisciplinary Reasearch (CIRET)

The process of the decline of civilizations is one of enormous complexity and its roots lie deep in obscurity. Of course, one can find multiple after-the-fact explanations and rationalizations without ever successfully dissipating the feeling that there is an irrational element at work at the heart of the process. Neither the masses nor great decisionmakers, as actors in a well-defined civilization, seem able to stop the decline of their civilization, even if they become more or less aware of the processes at work.

One thing is certain: this fall is always accompanied by a great unbalance between the mentalities of the actors and the inner developmental needs of a particular type of society. Although a civilization never stops proliferating new knowledge, it is as if these can never be fully integrated within those who belong to this civilization. And it is the human being who must be placed at the centre of any civilization worthy of the name.

The unprecedented increase of knowledge in our era raises the challenging question of how to adapt our mentality to being. The challenge is enormous, because the influence of the Western-type civilization around the globe is so pervasive that its collapse would be even more devastating than the destruction which we suffered in the two World Wars.

Within the framework of classical thought, the only existing solutions for escape from this declining situation are social revolution or the return to a supposedly “Golden Age.”

We’ve already tried social revolution and the results have been catastrophic. The New Man turned out to be only a sad, empty man. No matter what cosmetic alternations the concept of “social revolution” undergoes, they will not be able to erase from our collective memory what was experienced during the century now coming to an end.

The return to the Golden Age has not yet been tried, for the simple reason that the existence of a Golden Age in the first place has not been established. Even if one supposes that a Golden Age existed in time immemorial, such a return would have to be accompanied by an inner revolution of dogmatism, the mirror image of the social revolution. The different religious fundamentalisms which plague the world currently are an evil portent of the violence and bloodshed which would burst forth from this caricature of authentic “inner revolution.”

As always, there is a third solution, that which constitutes the object of the present manifesto.

Harmony between inner being and outer knowledge presupposes that these known facts would be intelligible, comprehensible. But can such comprehension exist in the era of the disciplinary big bang and relentless specialization?

In our time, a Pico della Mirandola is inconceivable. Today, even two specialists in the same discipline must make a serious effort to understand their respective results. There is nothing especially troubling about this insofar as it is the collective intelligence of the community attached to a certain discipline which leads to its progress, not simply a single brain which must necessarily know all the results of all his colleagues’ brains —

clearly an impossibility. Today there are hundreds of disciplines. How can a theoretical particle physicist truly hold a dialogue with a neurophysiologist, a mathematician with a poet, a biologist with an economist, a politician with a computer programmer, beyond mouthing more or less banal generalities? Yet, a true decisionmaker must be able to have a dialogue with all of them at once. Disciplinary language is an apparently insurmountable barrier for a neophyte, and each of us is a neophyte in some area. Is a modern Tower of Babel inevitable?

Perhaps a Pico della Mirandola in our time might be conceivable if he were to take the form of a supercomputer into which one could load all the known data which has been generated by all existing disciplines. This supercomputer would be capable of knowing everything while understanding nothing. Its user would be no better off than the supercomputer itself. The user would have immediate access to any results of any importance from any discipline, but would be incapable of understanding their meanings, still less of making connections between the results of different disciplines.

This process of “Babelization” cannot continue without putting our own existence into jeopardy, because a decisionmaker becomes increasingly more incompetent regardless of his or her intention. Without exception, each of the major challenges of our era — for example, the challenge of formulating an ethics adapted to the contemporary world — requires more and more competencies. However, it is obvious that even a group comprised of the best specialists from all the various disciplines would only be able to develop a generalized incompetence, for the simple reason that the sum total of competencies is not competence: on the technical level, the intersection between different domains of knowledge is an empty ensemble. Now, what is a decisionmaker, individual or collective, if he is not someone capable of taking into account all the givens of the problem that being examined?

The indispensable need for bridges between the different disciplines is attested to by the emergence of multidisciplinarity and interdisciplinarity around the middle of the twentieth century.

Multidisciplinarity concerns studying a research topic not in just one discipline but in several at the same time. For example, a painting by Giotto can be studied not only within the context of art history, but also within the contexts of the history of religions, European history, or geometry. Marxist philosophy can be studied by blending philosophy with physics, economics, psychoanalysis, or literature. Any topic in question will ultimately be enriched by incorporating the perspectives of several disciplines. Moreover, our understanding of the topic in terms of its own discipline is deepened by a fertile multidisciplinary approach. Multidisciplinarity brings a plus to the discipline in question (the history of art or philosophy, in our examples), but we must remember that this “plus” is always in the exclusive service of the home discipline. In other words, the multidisciplinary approach overflows disciplinary boundaries while its goal remains limited to the framework of disciplinary research.

Interdisciplinarity has a different goal than multidisciplinarity. It concerns the transfer of methods from one discipline to another. One can distinguish three degrees of interdisciplinarity: (a) degree of application (for example, when the methods of nuclear physics are transferred to medicine, which leads to the appearance of new treatments for cancer); (b) epistemological degree (such as, transferring methods of formal logic to the area of general law, which generates some interesting analyses of the epistemology of law); (c) degree of the generation of new disciplines (when methods from mathematics are transferred to physics, generating mathematical physics, or when mathematical methods are transferred to meterological phenomena or stock market processes, generating chaos theory; transferring methods from particle physics to astrophysics produces quantum cosmology; and the transfer of computer methods to art, lead to computer art. Like multidisciplinarity, interdisciplinarity overflows the disciplines, but its goal still remains within the framework of disciplinary research. It is through the third degree that interdisciplinarity contributes to what we have called the disciplinary big bang.

As the prefix “trans” indicates, transdisciplinarity concerns that which is at once between the disciplines, across the different disciplines, and beyond all discipline. Its goal is the understanding of the present world, of which one of the imperatives is the unity of knowledge.

Is there something between and across the disciplines and beyond all disciplines? From the point of view of classical thought there is absolutely nothing. The space in question is empty, completely void, like the vacuum of classical physics. Even when the pyramidal vision of knowledge is renounced, classical thought considers each fragment of the pyramid which is generated by the disciplinary big bang as an entire pyramid; each discipline claims that it is sufficient unto itself. From the point of view of classical thought, transdisciplinarity appears absurd because it has no object. In contrast, within the framework of transdisciplinarity, classical thought does not appear absurd; it simply appears to have a restricted sphere of applicability.

In the presence of several levels of Reality, the space between disciplines and beyond disciplines is full, just as the quantum void is full of all potentialities: from the quantum particle to the galaxies, from the quark to the heavy elements that condition the appearance of life in the universe.

The discontinuous structure of the levels of Reality determines the discontinuous structure of transdisciplinary space, which in turn explains why transdisciplinary research is radically distinct from disciplinary research, even while being entirely complementary. Disciplinary research concerns, at most, one and the same level of Reality; moreover, in most cases, it only concerns fragments of one level of Reality. In contrast, transdisciplinarity concerns the dynamics engendered by the action of several levels of Reality at once. The discovery of these dynamics necessarily passes through disciplinary knowledge. While not a new discipline or a new super-discipline, transdisciplinarity is nourished by disciplinary research; in turn, disciplinary research is clarified by transdisciplinary knowledge in a new and fertile way. In this sense, disciplinary and transdisciplinary research are not antagonistic but complementary.

The three pillars of transdisciplinarity — levels of Reality, the logic of the included middle, and complexity — determine the methodology of transdisciplinary research.

There is an interesting parallel between the three pillars of transdisciplinarity and the three postulates of modern science.

In spite of an almost infinite diversity of methods, theories, and models which run throughout the history of different scientific disciplines, the three methodological postulates of modern science have remained unchanged from Galileo until our day. Only one science has entirely and integrally satisfied the three postulates: physics. The other scientific disciplines only partially satisfy the three methodological postulates of modern science. However, the absence of rigorous mathematical formulation in psychology, history of religions, and a multitude of other disciplines does not lead to the elimination of these disciplines from the field of science. At least for the moment, not even an exact science like molecular biology can claim a mathematical formulation as rigorous as that of physics. In other words, there are degrees of disciplinarity which can respectively take into account more or less completely the three methodological postulates of modern science.

Likewise, the process of more or less completely taking into account the three methodological pillars of transdisciplinary research generates different degrees of transdisciplinarity. Transdisciplinary research, which corresponds to a certain stage of transdisciplinarity, will be closer to multidisciplinarity (as in the case of ethics); a research which corresponds to another degree will be closer to interdisciplinarity (as in the case of epistemology); and that corresponding to yet another degree will be closer to disciplinarity.

Disciplinarity, multidisciplinarity, interdisciplinarity, and transdisciplinarity are like four arrows shot from but a single bow: knowledge.

As in the case of disciplinarity, transdisciplinary research is not antagonistic but complementary to multidisciplinary and interdisciplinary research. Transdisciplinarity is nevertheless radically distinct from multidisciplinarity and interdisciplinarity because of its goal, the understanding of the present world, which cannot be accomplished in the framework of disciplinary research. The goal of multidisciplinarity and interdisciplinarity always remains within the framework of disciplinary research. If transdisciplinarity is often confused with interdisciplinarity and multidisciplinarity, (and by the same token, we note that interdisciplinarity is often confused with multidisciplinarity), this is explained in large part by the fact that all three overflow disciplinary boundaries. This confusion is very harmful to the extent that it functions to hide the different goals of these three new approaches.

Although we recognize the radically distinct character of transdisciplinarity in relation to disciplinarity, multidisciplinarity, and interdisciplinarity, it would be extremely dangerous to absolutize this distinction, in which case transdisciplinarity would be emptied of all its contents and its usefulness in action reduced to nothing.

The complementary character of disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary approaches is demonstrated in a stunning way, for example, by the our attitude toward death: how we attend to the dying. This relatively new approach to the dying is extremely important because in recognizing the role of our death in our life, we discover hitherto unsuspected dimensions of life itself. The way we assist the dying is greatly enriched by transdisciplinary research because deeper understanding of the present world must pass through deeper understanding of the meaning of our life and of our death in this world which is ours.

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Chapter 6: Summary and discussion

The idea of this concluding chapter is, first and foremost, to consider the implications of what has been learnt during the workshop for improving our understanding and management of cross-disciplinary research. As a part of the larger MUSCIPOLI-project, these insights are furthermore, expected to contribute to a more generic understanding of the complex and hence uncertain links between science policy aims, processes and downstream scientific activity, outputs and outcomes.

As in the first MUSCIPOLI-workshop and report, at least two positive outcomes of this second workshop were observed. Firstly the workshop enabled a promotion of dialogue and exchange between a number of science policy practitioners, administrators and scholars, and a facilitation of knowledge-sharing within and between these groups of actors. Secondly the presentations and the discussions of the workshop raised a number of more generic questions, discussions and conclusions that are relevant for a broader audience than just the workshop participants.

In this final chapter a brief summary of the contributions will be presented alongside a concluding discussion of a number of central issues touched upon in the written contributions as well as in the introductory chapter and in the discussions of the workshop.

Summary

As described in the introduction, science policy is a relatively new policy area, which nevertheless already has undergone fundamental changes. New political initiatives, new institutions and new operating principles have been put to use in many countries. The consequences of these changes are highly uncertain.

Given these changes, this workshop has looked into the question of how scientific activities are performed – with a specific focus on the design and delivery of inter- and pluri-disciplinary research as an important operational principle in contemporary science policy. Uncertainty seems to have become a growing problem for science policy makers, administrators and practitioners as the traditional foundations for science policy increasingly have been questioned by many; not only from a theoretical but also from an empirical perspective.

The drivers of increased cross-disciplinarity are internal as well as external. It has often been stated, that the traditional divisions of knowledge have been under increased pressure in the late twentieth century. There has been talk of a blurring and mixing of genres, of a growing permeability of boundaries and even of a postmodern return to grand theory. There are new hybrid fields, collaborative research in many forms, new divisions of intellectual labour, increased borrowing across disciplines and a variety of holistic perspectives. At the same time the external political and societal pressure for cross-disciplinarity has increased across the western countries, and today it is safe to say, that cross-disciplinarity has become an important operational principle in contemporary science policy. In spite of these developments there is still a considerable uncertainty related to the design and delivery in practice. In the following some of the main arguments and conclusions from the workshop will be drawn to attention.

Chapter 2 – The opening speech

In the opening speech and consequently in the first contribution to this report **Siune**, Director of the Danish Institute for Studies in Research and Research Policy presented a broad introduction to the central issues of the workshop. A number of central questions were outlined, and as illustrative examples it was shown how areas such as mass-communication, social medicine, materials, ICT and bio-technology have emerged as new inter-disciplinary fields.

Chapter 3 - The research funding level

The cluster of proceedings in the third chapter were oriented towards the research funding level with a main focus on the research councils as some of the most important funding agencies at the national level, and with a complementary focus on DG-research as an important funding organisation at the European level. A key-issue in these contributions was the discussion of if, or how, cross-disciplinarity could be facilitated through an institutional set-up in favour of this operational principle.

In the first contribution to this chapter **Aagaard,** also from the Danish Institute for Studies in Research and Research Policy, described how it has been attempted in Denmark to create a research-council structure more in favour of cross-disciplinary research. He argued, that due to widespread resistance in the academic system the traditional disciplinary structure had so far proved very difficult to change, but that strong forces were continuing to work for structural change in Denmark, resulting in the proposals of new and far-reaching reorganisations by influential science policy actors. It was also argued, that a number of other instruments had been put to use to increase cross-disciplinary research activity as a consequence of the lacking success in creating a more cross-disciplinary research council structure.

The next two contributions focussed on the initiatives taken at the research council level to increase and facilitate research crossing disciplinary borders. **Caswill**, Director of the UK Economic and Social Research Council, analysed the extent to which structure is important, and the way policy decisions interact with the interests of key actors and with the external environment. This historical, structural and political analysis helped to explain the puzzle about why research across the disciplines is difficult to achieve. He concluded that the apparently simple question of why a desirable objective like interdisciplinarity is not achieved can be unpacked into discussion of tensions about the nature of social science and scientific knowledge, about the structural place and importance of disciplines in academic institutions, and about the ability of Research Councils as institutions to influence the nature and direction to research.

Similarly **Niessen**, Director of the Division for Humanities and Social sciences in the German Research Council, described the funding structure of DFG and the institutional incentives to induce and facilitate cross-disciplinary research activity. In spite of the institutional set-up in favour of cross-disciplinarity Niessen emphasised that this operational principle still is regarded as a “problem” from all perspectives, and ended up with a rather surprising conclusion; that there is a negative relationship between programmatic impetus on and actually realized degree of interdisciplinarity.

In the last contribution to this chapter **Valdalbero & Osorio** from DG Research described how the conduction of inter- and pluri-disciplinary research is recognised and aimed at the Community level. They argued, that the set-up of evaluation processes reflects this need and that it is the mechanism the Community counts on, to implement the required inter- and pluri-disciplinarity.

Chapter 4 - Programs crossing disciplinary borders

In chapter 4 the focus was moved from the research funding level to the actual research performing level. Two British and one German cross-disciplinary program were presented. At the workshop a couple of French programs were also presented, but for different reasons it was impossible to include them in the final report.

In the first contribution of this chapter **Page** shared his management experiences as Director of the cross-disciplinary “Future Governance Program” funded by ESRC. He reflected on the incentives and disincentives in relation to the management of such a program. He argued, that risk and uncertainty are a central part of the management-responsibilities, but ended up concluding that the advantages far outweigh any difficulties.

In the next contribution **Rayner**, Director of the ESRC Science in Society Program, went beyond the description of his own program and discussed in more broad terms the relationship between disciplinarity and inter-disciplinarity. He argued, that inter-disciplinary research depends on the existence of strong, but permeable disciplines and that inter-disciplinarity is itself a specialized skill that thrives in specialized niches on the periphery of disciplines.

In the final contribution of this chapter **Scheuermann**, Scientific Coordinator of the Global Environmental change program, shared his management experiences. He argued, that management of large-scale cross-disciplinary programs is a specific task and not the task of the researchers. Consequently he emphasised, that program managers need specific training in science/research management.

Chapter 5 - Crossing of disciplinary borders in specific institutions

Finally the workshop focussed on specific institutions entirely or partly specialising in research crossing disciplinary borders. Unfortunately only German and French Institutions were presented in this chapter, which in some ways limit the institutional variety. But the contributions still show a remarkable variety of institutional designs, and the German presentations in particular illustrate the variety that can be found even within one country.

In the first contribution to this chapter **Bruhns** described how the Maison des Sciences de l'homme in Paris offers an area for interdisciplinary as well as for inter-institutional and international encounters to exterior researchers, to its temporary guests, and to the French researchers hosted for long time periods. Bruhns explained how the MSH intervenes in three ways for inter-disciplinarity: Amongst the projects that are submitted within its walls and outside, it favours those that carry an interdisciplinary dimension; It actively provokes meetings and collaborations between researchers from different disciplines and it puts support and instruments that can go from the temporary allocation of a work-area to the creation (and temporary support) of a scientific review, at the disposal of researchers that carry forward an inter- or pluri-disciplinary project.

In the next contribution **Bouget,** Director of The Maison des Sciences de l'Homme in Nantes, presented another but rather different MSH-institution. Apart from describing his own institution, he pointed to the potential conflict between cross-disciplinary programs and traditional disciplinary institutions. He suggested, that in the future it could be expected that the process of development of interdisciplinary research will bring about an inversion of the traditional multilevel organisation, with the interdisciplinary research becoming the primary tier of research and the disciplinary research becoming the network of researchers and the second tier of the organisation.

Following that **Roggenhofer** Executive Secretary of ZiF (*Zentrum für interdisziplinäre Forschung*/Center for Interdisciplinary Research, Bielefeld University) described a German institute for advanced study, which is open to the whole range of interdisciplinary basic research. Its operating principles and internal structure were outlined and several examples of recent projects were considered, illustrating not only its mission and the character of its work but showing also successes and advantages as well as specific problems of the ZiF-approach to basic interdisciplinary research. Furthermore future perspectives were shortly outlined, and an attempt to offer some recommendations for a more pertinent science policy was made in the concluding section.

In the following contribution **Nettelbeck**, Secretary of The Institute for Advanced Studies in Berlin (Wissenschaftskolleg Berlin), argued that such institutes are necessary elements of a system of research and higher education. He explained how, besides providing time and concentration for an intensive research phase, Institutes for Advanced Study fulfil a compensatory function in addressing especially the aim of planning for the unforeseen. According to Nettelbeck this aim only makes sense, if it is seen in the context of

a large and diversified system of research and higher education. He argued, that in this sense they presuppose that there are programs, projects, specialized research institutions and Universities with disciplinary structures.

In the next contribution **Thurn**, Head of research Policy and Coordination of Wissenschaftszentrum Berlin für Sozialforschung (WZB), presented a discussion of the policy contexts and research structures, which surround WZB. Problem-orientation and the institutionalisation of pluri-disciplinary research are central issues in this presentation.

The last institutional presentation came from **Mehser**, who described the structure and objectives of the Hanse Institute for Advanced Studies. She argued, that cross-disciplinarity here is a necessity in order to accommodate the varied clients of the institute and its limited and heterogenous technology base.

The final contribution in this chapter differed from the previous in the sense that no physical institution was presented. Instead **Nicolescu**, President of the International Center for Transdisciplinary Reasearch (CIRET) presented a Manifesto for Trans-disciplinary research. CIRET in France is a loose association of initially 50, now 200, intellectuals including several Nobel prize winners, to promote trans-disciplinarity, but it has no fixed budget, just subvention for specific work. Not surprisingly Nicolescu advocated for a very strong support for increased trans-disciplinarity.

Discussion

As described in the summary, the contributions as well as the discussions of the workshop raised a number of important issues related to the design and delivery of pluri- and inter-disciplinary research. In the introduction it was argued, that an important aim for the workshop and this report was to identify and discuss central commonalities and divergences of the experiences described in the contributions. By identifying and discussing common structures, instruments, management principles, barriers, successes etc. this report on operational principles is expected to contribute to the formulation of a number of more generic recommendations in the Handbook of policy guidelines, that will be the end-result of the overall MUSCIPOLI-project.

Out of the sum of contributions and discussions a number of important questions have materialised. These key issues will receive special attention in the following discussion, where central arguments from the contributions are brought to attention.

The issues are:

- Objectives
- Barriers
- The relationship between disciplinarity and cross-disciplinarity
- Instruments
- Definitions
- Recommendations

Objectives

An important question in relation to this report is, of course, why increased crossing of disciplinary borders is perceived as a key operational principle in contemporary science policy. What are the objectives for this operational principle, and in what way is an increased cross-disciplinary research activity expected to complement the traditional disciplinary mode of knowledge-production?

These objectives were stated explicitly in a number of the contributions. Cross-disciplinarity is described as an instrument that can help accomplish a range of objectives by addressing broad issues and answering complex questions that are beyond the scope of any one discipline. Consequently crossing of disciplinary borders is regarded as a promising instrument in science policy, as it is expected to generate more innovative and more excellent research. It is also regarded as a necessary approach to solve societal problems and to increase wealth-creation. Bouget describes cross-disciplinary research as a marriage between conceptual frameworks and methodologies, reflecting the need to bridge, not only the different scientific representations of the real world, or the sharing of understanding among researchers, but sometimes also the compiling of common dictionaries of terms and concepts or the definition of new common objects of research, etc. All these scientific ambitions are supposed to avoid the drawbacks to disciplinary research such as the narrow compartmentalisation of knowledge, a specialised communication of scientific knowledge, ‘black holes’ in scientific knowledge, the risk of a tunnel-like vision, unintelligible jargon, etc. It was furthermore argued, that cross-disciplinary research can lead to creativity for new scientific knowledge in that the very act of creation often brings previously unrelated ideas together.

By Valdalbero & Osorio it was similarly argued, that the new challenges facing European research require a stronger co-ordination among stakeholders and an inter- and pluri-disciplinary effort in order to foster a competitive and sustainable development. They also argued, that it is believed to be now, more than ever before, one of the basic driving forces behind economic and social progress as well as a key factor in business competitiveness, employment and quality of life.

Much along the same lines Aagaard argued, that the aim to facilitate crossing of borders in research increasingly is viewed as a fundamentally important instrument in the design of modern research policy in most western countries. Barriers between disciplines, institutions and sectors are seen as major obstacles to a well-functioning research-system. Underlying the demands for increased crossing of disciplinary, institutional, sectorial and national borders is often an a-priori assumption that a political facilitation of such bordercrossing will provide conditions that are good for societies outcome of research - with cross-disciplinarity perceived as one of the essential means for research to be socially accountable and help solve the complex problems of modern society. It was furthermore argued, that the problem-driven orientation of modern research policy creates a need for an increasing focus on bringing insights from different disciplines together, as many societal problems are seen as generally falling between or spanning several disciplines. Therefore there is a demand for a more holistic approach than the more partial one that single disciplines may be able to provide.

As Aagaard also pointed out, these arguments have been heavily promoted not only nationally but also internationally through organisations such as OECD and EU. As an example, the EU's Research Commisioner Philippe Busquin has recently argued, that he is "*convinced that the greatest innovations will be derived from new interdisciplinary approaches*" (Research Europe, 2000).

Barriers

Many more arguments in favour of cross-disciplinarity could be found throughout the report, but the flip-side of the questions of the objectives and the potential advantages of this important operational principle in science policy is, of course, the questions of the potential problems and barriers to a successful implementation of cross-disciplinarity. As Caswill argued, this operational principle is widely applauded, and yet extraordinarily difficult to achieve. So when discussing the objectives of cross-disciplinary research, it is important to remember that the potential benefits in many cases have proved extremely difficult to achieve in practice, and that many barriers and problems are standing in the way of success.

Aagaard argued, that crossing of disciplinary borders often is portrayed as good per se, and that this particularly is true for the concept of inter-disciplinarity. But in the political praise of these operational principles it is often forgotten, or not mentioned, that crossing of disciplinary borders also can create a number of problems in the performance of research. He argued, that it appears to be generally accepted, that cross-disciplinary research holds a potential for increased creativity and that this operational principle can result in an increased problem-solving ability. But on the other hand, it also holds a potential of communication and collaboration problems, and this part is often forgotten. In a recent Danish Ph.D. thesis on this issue, it is concluded, that we don't know very much about in which situation which potential takes the upper hand in the cooperation (Ernø-Kjølhede, 2001). Furthermore he argued, it is often not only disciplinary borders that are crossed, but also institutional or even national boundaries, which ads even more potential difficulties to the research-collaboration. For decision-makers and administrators it is important to remember that advantages and disadvantages between different modes of research have to be weighed against each other.

But the potential barriers to successful cross-disciplinarity are not only operational, but just as well structural and institutional. Caswill argued, that when individual scientists are interested in a particular research approach, funds may be available and policy encouragement provided, but there are however often high cognitive barriers and opposing institutional pressures. He argued, that science policies such those supporting interdisciplinarity within the social sciences do not operate in a vacuum. Science policy decisions are implemented in organisational and cognitive locations, where they interact with existing structures, interests and ideas. Policies in support of activities and processes like interdisciplinary research are part of larger processes of influence and agency. Caswill concluded, that the apparently simple question of why a

desirable objective like interdisciplinarity often is not achieved, can be unpacked into discussion of tensions about the nature of social science and scientific knowledge, about the structural place and importance of disciplines in academic institutions, and about the ability of Research Councils as institutions to influence the nature and direction to research. Caswill also emphasised that disciplinary differences remain very much in evidence within ESRC underneath the multi-disciplinary structures. The representative academic institutions with whom the Council needs to work are almost all discipline based. The large number of applications which reference more than one discipline may be more the result of perceptions of ESRC requirements than of research plans which genuinely cross the discipline boundaries. The interventions in these systems of a funding agency like ESRC may therefore be less significant then they appear from a distance

Similarly Niessen argued, that even though the institutional set-up in DFG seems fit to support cross-disciplinarity, it is still regarded as a "problem" from all perspectives. He concluded, that it still is an important objective to identify and implement measures geared at soliciting interdisciplinary cooperation in larger programmes and centres, which goes beyond the superficial level of just gathering different disciplines under a common umbrella. He suggested, that size in itself could be a barrier, and that successful cross-disciplinarity was more likely to be realised in smaller units, even though the institutional impetus for cross-disciplinarity is larger in the large-scale programs.

Rayner contributed to the discussion of barriers, when he argued, that established institutions are ambivalent about marginality. On the one hand marginal scholars can provide important critical perspectives that cannot be obtained from within. They can also make novel connections across knowledge borders. On the other hand, he argued, marginals also threaten the very boundaries that constitute the established order. He argued, that perhaps this partly explains why so many universities, especially in the United States, loudly proclaim their interdisciplinary commitments, while conducting disciplinary "business as usual" within their academic departments, and declining tenured positions to those who stray too deeply into the academic no-man's land of long-term interdisciplinary work which cannot be judged by unambiguous departmental criteria.

Another barrier was pointed out by Bouget, who argued, that different types of conflicts emerge, when cross-disciplinary programs are imposed on the traditional disciplinary research system. Often the lack of consistency between the cross-disciplinary programs and the disciplinary organisation in the traditional research institutions creates problems in forms of destabilisation, difficulties in power-sharing and problems of location. Bouget argued, that this inadequacy between the programmes and the organisation could jeopardize the visibility of the programmes, and cause conflicts among researchers involved in the programme as well as between the researchers who are involved and those researchers, who are not involved in the programmes.

Aspects of the same conflict was precisely phrased by Thurn, when he argued that problem-oriented research by definition goes beyond the scientific access offered by a single discipline. The structure of teaching and research at the universities, however, often makes it difficult to work on themes that transcend the boundaries of an individual department or chair. It can therefore be seen as particular challenge for institutes outside of the universities to develop innovative institutional arrangements in order to bring together perspectives and persons for inter- or pluri-disciplinary approaches.

A final barrier of cross-disciplinarity, that was mentioned in a number of contributions, was the lack of direct incentives for researchers at the individual level. Rayner pointed out, that incentives in the form of career opportunities are limited: cross-disciplinary scholars are likely to experience at least some frustration at the lack of formal recognition in titles, prizes, and resources that disciplines and their institutions bestow upon their own. He argued, that the excitement of interdisciplinary work often is its own reward – which is just as well since its practitioners are often punished for their impertinence, not overtly, but simply by being denied the more conventional rewards of disciplinary scholarship.

Similarly Nettelbeck argued, that under the normal career patterns of most of the disciplines a stay at such a fanciful place as an Institute for Advanced Studies is considered to be a waste of time for an excellent Post-doc, even if the conceptual enrichment might be very important with respect to innovation. He raised the question of what Institutes for Advanced Study could do for postdocs, so that their career risk is diminished? Nettelbeck emphasised, that institutions and programs easily could become marginalized if they did not respect sufficiently the fact that scholars make their careers within disciplines.

Thurn emphasised this argument as well, pointing to the potential structural tensions and potentially conflicting interests that WZB had experienced in relation to the major players in the traditional system of academic research and teaching: In terms of programs and personnel, the WZB, operating outside of the university, developed an enormous degree of extremely flexible and fluid structures, but it lacked the longer-term prospects and stable agendas necessary to offer career perspectives to its fellows who found it increasingly difficult to bridge the gap between the functionally different research environments: moving from training in a discipline over to “interdisciplinary” work and back again to a “disciplinary” academic position as university professor. As a consequence of practical experience with this type of “interdisciplinarity”, it became a matter of increasing urgency to find institutional structures that would narrow the gaps and ease the tensions between this “new” type of research and the “old” environment.

These barriers mean, that cross-disciplinary programs and institutions often are struggling for legitimacy in the academy, and the “reformists”, who support cross-disciplinary movements, are often outnumbered by the “traditionalists”, who have doubts about cross-disciplinary initiatives. As the contributions showed there are many reasons for this widespread scepticism.

The relationship between disciplinarity and cross-disciplinarity

The discussion of the objectives and the potential barriers of cross-disciplinarity as a key operational principle is leading directly to the question of the relationship between the traditional disciplinary research-system and the initiatives in favour of cross-disciplinary research. This question was central in a number of the contributions to the workshop and came up several times during the discussions.

In a number of the contributions there were a strong reaction towards the popular idea of a steady advance towards a Mode 2 future without disciplines (Gibbons et al, 1994). Rayner argued, that a paradox is inherent in the idea that scholarly endeavour is or should be moving inexorably in the direction of universal inter-disciplinarity. According to Rayner inter-disciplinary research depends on the existence of strong, but permeable disciplines, and he argued that inter-disciplinarity is itself a specialized skill that thrives in specialized niches on the periphery of disciplines. He emphasised how researchers should cherish their disciplines identities, because it is only when they are confident of their core identities that practitioners feel safe enough to allow their borders to become permeable, without abandoning them altogether, and he argued that this is the key to successful interdisciplinary work. Rayner went on to argue, that to strengthen interdisciplinary capabilities for appropriate applications, funding agencies and scholarly institutions need to nurture these niches, rather than establish interdisciplinary standards for everyone. According to Rayner this is where the paradox lies for those who see the future of scholarship in the mainstreaming of interdisciplinary work, the ultimate triumph of Mode 2, or the creation of a universal transdisciplinary discourse. By definition, a universally interdisciplinary landscape would be an intellectual monoculture. Without thriving disciplines, the very idea of interdisciplinary discourse becomes moot.

Nettelbeck made a similar argumentation, but in his contribution the focus was moved from the individual level to the institutional level. He argued, that cross-disciplinary institutions as the Institutes for Advanced Study besides providing time and concentration for an intensive research phase fulfil a compensatory function in addressing especially the aim of planning for the unforeseen. He argued, that this aim only makes

sense, if it is seen in the context of a large and diversified system of research and higher education. In this sense, he argued, they presuppose that there are programs, projects, specialized research institutions and Universities with disciplinary structures. Again the conclusion was, that cross-disciplinarity is meaningless without disciplinarity.

Thurn delivered an interesting example of an attempt to find an institutional structure with a balance between the disciplinary and the cross-disciplinary aspects of research. The solution for WZB was a new institutional set-up, still in operation today. This set-up provides a more complex structure with, on the one hand, a greater number and variety of smaller research units (of four to six researchers plus visiting fellows, doctoral students and researchers on third-party-grants etc., working under a director who, by joint appointment, is a full professor – with a reduced teaching load – at one of the Berlin universities); these units incorporate theoretical-conceptual perspectives growing out of the different social science disciplines. The smaller units are, on the other hand, brought to bear on a larger research area, the different dimensions of which can thus be studied from different theoretical points of view and with the expectation of additional synergetic effects. Through the interlocking of smaller units, representing (disciplinary) perspectives, with a more encompassing framework, representing the (interdisciplinary) dimensions of a problem area, this set-up is meant to bridge the "systemic gap" with the academic environment by facilitating the transitions to and from the universities, while at the same time retaining problem-orientation and pluri-disciplinary perspectives.

Another question relatede to the relationship between disciplinarity and cross-disciplinarity is, if the current balance between disciplinarity and cross-disciplinarity has found stable level, or if the balance is moving from one operational principle in the direction of another. Bouget suggested, that in the future we can imagine, that the process of development of interdisciplinary research will bring about an inversion of the multilevel organisation, with the interdisciplinary research becoming the primary tier of research and the disciplinary research becoming the network of researchers and the second tier of the organisation. Similarly Nicolescu argued, that a move towards trans-disciplinarity is essential. This statement was challenged in a number of contributions, but the question and the uncertainty remain. How do we find the optimal balance between these two key operational principles? This balance need to be found at both the international level and at the national level, as the potential conflicts applies to all types of cross-disciplinary initiatives from institutions and large-scale programs to minor projects.

Instruments

Having discussed the objectives and barriers of cross-disciplinarity, and the relationship and balance between cross-disciplinarity and traditional disciplinarity as two key operating principles in science policy, it is natural to progress to the question of instruments. It is central to explore, how it is attempted to induce and facilitate cross-disciplinary research activity. What instruments are used at different levels of the science policy system?

The contributions showed that cross-disciplinary research takes place in many settings and in many forms. Throughout the report a variety of different instruments used to promote this operational principle were illustrated. The instruments and measures used at different levels of the science policy system vary from different structural configurations at the research funding level to a multitude of programs and institutions at the research performing level, and from different evaluation-methods to management principles and incentives for individuals as well as for institutions.

Chapter three showed that the *research council structures* are perceived as an important instrument to induce and facilitate increased cross-disciplinarity. It is attempted to reduce inter-committee or inter-agency boundaries, to eliminate bases for implicit budgetary egotisms in the decision-making process on centres and programmes – and to promote networking across disciplines by explicitly asking for it in the philosophy

of the funding schemes. However both Caswill and Niessen emphasized, that the structures alone in favour of cross-disciplinarity are far from sufficient to secure a successful implementation of this operational principal. As discussed earlier in this chapter the traditional disciplinary structures of the surrounding science policy system limits the influence of cross-disciplinary initiatives taken at the research council level. With Caswill's words an important lesson is, that an internal analysis of science policy organisations alone, whether of structure, or policies or actors, will not provide sufficient explanation for the difficulties. That can only be attempted by examination of the interaction of science policy organisations and initiatives with the science they seek to influence.

In most cases the research councils are also responsible for the design and funding of large cross-disciplinary *programs*. The programs are some of the most cost-intensive instruments used to induce and facilitate cross-disciplinarity. The contributions gives examples of a number of different programs, predominantly social sciences programs, and it was evident that there are major variations in terms of funds, themes, management, out-put expectations etc. However Niessen expressed doubts on the ability of large-scale cross-disciplinary research programs to develop successful cross-disciplinary collaboration beyond the rudimentary form of taking notice of each other. He suggested, that the larger the program, the less likelihood of realising successful cross-disciplinarity.

Another group of very visible instruments are the variety of *specialised institutions* with different forms of cross-disciplinarity as a specific and explicit objective. The institutions presented in this report vary a lot in terms of organisation, autonomy, size, funding, research-focus etc. Some of the institutions are more or less autonomous, while others are smaller units within larger, more traditional institutions.

The examples range from ZIF in Bielefeld, that invites researchers from different disciplines in residence for the achievement of a common project - to another and more frequently used way of approaching cross-disciplinarity exemplified in the institutes for Advances Studies (represented in this conference by the Wissenschaftskolleg Berlin among others), that brings together, in residence, researchers from different disciplines with individual projects thereby provoking 'spontaneous' interdisciplinary contacts. Another variation is the French Maison des Sciences de l'Homme, which establishes or receives, for limited periods of time, experimental groups seeking to determine new directions and methods for research in the social sciences. MSH encourages dialogue among researchers, through symposia, round tables, workshops and the Internet. It is also concerned with the collection, publication and dissemination of scientific information though the means of its publishing house and on variety of scientific levels.

Within these (and the remaining presented institutions) different mixes of instruments and measures are used. They vary from different forms of research groups, smaller programs and different forms of projects - to workshops in varying sizes and forms, task-forces and collaboration between arts and science etc.

Different types of *Management* are other important instruments, that relates to all kinds of cross-disciplinarity, from the biggest institutions and programs to the smallest projects. Research management is in itself a difficult and highly debated issue, and when the problems of managing researchers with different disciplinary backgrounds are added, the potential barriers and difficulties become even bigger.

Scheuermann suggested, that effective information tools used by the program leaders are key instruments for large-scale programs. As useful instruments he mentioned, regular newsletters for the program members, providing information about the organisational and structural status of the program, the promotion of joint interdisciplinary publications, the editing of joint program documentations (for the members and for research partners and people outside), the development of a program logo, the organization of regular meetings on the group level to provide enough time for group discussions and exchange, the development of a media

concept with strong participation of the projects and an electronical infobase in the World Wide Web including discussion forums.

He furthermore advocated for corporate communication as a practical tool to start discussions and to promote communication at all levels, because it reflects on the communication between the members of the program and between the program and its environment in an integrated approach, and he emphasised, that members of such programs should be trained in using communication tools and should be informed about the specific corporate communication in the program. Another important argument was, that management of large-scale cross-disciplinary programs is a specific task and not the task of the researchers. Consequently Scheuermann emphasised, that program-managers need specific training in science/research management. This argument was supplemented by Thurn, who argued that in large research units the need for “research management” can be so demanding that the possibilities for the responsible director to personally participate in the scientific work might become narrowly limited.

Other less tangible management qualities were mentioned in a number of other contributions. Rayner suggested that experience with operational problems and challenges of building collaboration across disciplinary boundaries counts, when it comes down to conflict resolution and motivation. He argued, that often the role of management is pastoral or therapeutic as much as it is intellectual and scholarly. Similarly Page pointed to a number of different roles and responsibilities of a program-manager, and emphasised how different phases of the running of a program requires different management skills.

Another group of instruments, which have been touched upon previously in this discussion, are the direct and indirect *incentives* at the level of the individual researchers. There is a very limited use of this instrument in terms of formal recognition in titles, prizes, career-opportunities and resources for cross-disciplinary scholars, but it should nevertheless be mentioned as an important measure to increase the attractiveness of this operational principle. Thurn gave an example of how it could be attempted to create an institutional structure, that facilitated cross-disciplinary activity, while at the same time allowing individual researchers to pursue the more traditional disciplinary incentives.

Finally *evaluation* as an instrument needs to be mentioned. It is a key instrument and probably one of the most debated in relation to cross-disciplinarity. Ex-ante as well as ex-post evaluation remains an unsolved problem in the management of cross-disciplinary research. There are no widely accepted criteria for evaluating collaborative work and the prevailing disciplinary standards are often inappropriate. Conventional productivity measures such as the number of publications and citations do not readily apply. Often cross-disciplinary research results in fewer individual publications, more collective authorships outside mainstream disciplinary publications, and peer group evaluation is difficult to achieve.

Rather surprisingly, this issue was only addressed briefly at the workshop and only in a couple of the contributions. There was a limited discussion of different evaluation-methods, and the potential problems related to these methods were one of the issues, which deserved a more thorough discussion. However the conflict between disciplinary and cross-disciplinary evaluation-methods was described in a couple of contributions. Aagaard described, how the problem of evaluation was very explicit in the debate concerning the Danish Research Council Structure. In this case the opponents of a cross-disciplinary research council structure argued, that in their view new scientific departures did not happen *between* traditional disciplines, but instead by combining approaches, methods and theories from different disciplines. Therefore, it was argued, it was still necessary to use the well-established disciplinary quality-criteria as a starting point for funding procedures. In their view cross-disciplinary initiatives would in most cases require a simultaneous evaluation in different disciplinary research councils, and these procedures were already well integrated in the disciplinary research council system, while the alternative would be evaluation in a number of subcommittees. On the other hand, Caswill pointed out, that such a disciplinary assessment- or evaluation-

structure could be a barrier to research across disciplinary boundaries, as the case of the Higher Education Funding Councils' Research Assessment Exercise (RAE) illustrated. The allocation of the research element of the first level, baseline funding to British Universities are determined on the basis of disciplines or disciplinary sub-fields, and according to Caswill, this is by many perceived as a barrier for increased cross-disciplinarity.

Valdalbero and Osorio listed the evaluation-methods used by DG-research in the only contribution, where specific evaluation criteria were described. Not only scientific and technological quality are evaluated in DG-Research, but also aspects such as management skills, the quality of the partnership, which is being set up, community added value and contribution to EU-policies, contribution to Community social objectives and economic development and scientific and technological prospects. All these criteria are born in mind when external experts (coming from different countries, backgrounds and disciplines) evaluate different proposals. Their relative importance is also considered and thus, a weighting factor is included in the overall process. They argued, that many variables from different fields and domains and many stakeholders are taken into account in order to guarantee that the results of the investment efforts coming from the Community funds are maximising their efficiency.

It is strongly debated if and how some of these aspects can be evaluated in practice, and at the workshop these evaluation-criteria were discussed. Among others, Rayner challenged this evaluation-procedure and asked if anything surprising came out the chosen projects – implying that to many and to specific evaluation criteria could be a barrier to truly innovative and path-breaking research.

This discussion illustrated the conflict between the well-established and respected disciplinary quality-criteria and the criteria explicitly designed to evaluate cross-disciplinary research, and underlined the fact that a balance are difficult to achieve. However, a number of the contributions indicated, that well-functioning methods are used in relation to some of the presented programs and institutions. Unfortunately these methods were not discussed at the workshop.

As a concluding comment in relation to the variety of instruments illustrated in the report, it should be mentioned, that no clear patterns of the use of different instruments seem to be visible across countries based on the contributions. The instruments are used in different forms and in different mixes across the represented countries, but the contributions nevertheless show elements of convergence. This is not unexpected, as actors in situations of great uncertainty tend to search for ready-made models of what to do, and imitate what appears to be a successful measure by someone else in a similar situation.

Terminological confusion

The question of the definitions of central terms is another important issue that needs to be addressed when discussing crossing of disciplinary borders in research. Multi-disciplinarity, pluri-disciplinarity, cross-disciplinarity, inter-disciplinarity and trans-disciplinarity are just some of the terms used to describe different forms of research collaboration crossing disciplinary borders, and unfortunately these terms are not always used in a systematic or even logic way.

It has been argued, that "*there is a tendency for a number of authors writing about the crossing of disciplinary boundaries not just rarely to clearly define what is meant by the various terms they apply, but also to use the terms interchangeably, and more or less take for granted that everybody will know what they mean anyway*" (Ernø-Kjølhede, 2001, 104).

It has often been attempted to create a terminological hierarchy to distinguish levels of integration by using specific labels, but no authoritative definitions seem to have been accepted. The popular term cross-

disciplinarity has been mentioned as an example of this terminological confusion. It has been used for several different purposes: to view one discipline from the perspective of another; as rigid axiomatic control by one discipline; as the solution of a problem with no intention of generating a new science or paradigm; new fields that develop between two or more disciplines; as a generic adjective for six different categories of discipline-crossing; and as a generic adjective for all activities involving interaction across disciplines (Klein, 1990, 55). Obviously, there is no right or wrong definition of this term, and the same terminological confusion can be found in the use of other central terms. These differences occur because labels are not neutral, and they can be used in many different ways, when they are not based in a well-developed theory.

These terminological problems are also visible in the contributions to this report. The terms are used in different ways throughout the report, but as Rayner argued in his contribution, he is aware of the many frameworks that define these terms in different ways and also introduce additional ones such as trans-disciplinary. He accepts, that it is pointless to argue which framework is best, and merely offer his definition in an effort to communicate the complex character of the research and interaction that he took part in.

Similarly it is beyond the scope and ambition of this report to come up with a new set of definitions or choose one set instead of others, but as Rayner argued, the very least we can do, is to make clear how we use the terms. The confusion in definitions is an important element, as a clear terminology, of course, is a prerequisite for reducing the uncertainty. As Aagaard argued, there are important differences between different forms of cross-disciplinary research. It was argued that, the more integrated the collaboration of different approaches, methods and theories, the bigger the barriers and potential problems, that have to be overcome, will be. On the other hand, it was also argued that the more integrated the collaboration of approaches, theories and methods, the bigger the likelihood of creating not only more economically or socially useful knowledge, but also more scientifically interesting knowledge. Consequently it is important for decisionmakers, administrators as well as for practitioners to make the central terms crystal-clear to avoid misunderstandings. It is similarly important to be aware that the demands in terms of structures, instruments, management, time etc. are different for different forms of cross-disciplinary research activity.

Recommendations

As a final important issue in this discussion the recommendations put forward in the contributions should be mentioned. Throughout the report different recommendations were suggested by the participants as conditions, which contribute to the success of any successful cross-disciplinary research-project or -programme. In his contribution Rayner listed seven recommendations, or what he labelled as seven pillars, for inter-disciplinary projects, and these recommendations summed up the majority of arguments in a number of the other contributions. Consequently Rayners recommendations will function as the basis for the following discussion.

The most important recommendation is, that projects should be problem- or topic-driven. Rayner argued, that no matter what personnel or resources you may have to throw at a topic, a poorly defined, vague, abstract, or grandiose problem formulation will not grab and retain the focussed interest of the researchers. They will soon balkanise the issue and the funding and revert to pursuing more narrowly disciplinary sub issues. This recommendation was also mentioned by Niessen, Roggenhofer and Thurn among others, who all emphasised the importance of a topic-driven foundation for cross-disciplinary research.

Secondly, it was argued, that participants should be selected for a combination of confidence in their disciplines of origin and openness to other ways of viewing the world. This model of confident, but permeable, disciplines was in a number of the contributions perceived as absolutely essential to interdisciplinary success.

The third factor is size. Rayner argued, that a project needs to have a critical mass of participants from the “minority” disciplines in order to attain a balanced collaboration. As another aspect of size Niessen, Thurn and Roggenhofer emphasised the importance of small units. This recommendation is also in line with previous studies, where a number of participants between 5 and 10 and a balance of disciplinary perspectives have been described as the optimum situation (Klein, 1990, 129).

Time for confidence building is the fourth recommendation. Cross-disciplinary research requires more time than mono-disciplinary research. This additional time is among other things required to assimilate each other’s expertise and disciplinary language.

The fifth recommendation is a supportive reward structure. Cross-disciplinary research lacks the majority of incentives of traditional disciplinary research in the form of rewards, titles, career opportunities etc., so different incentives are essential to attract qualified researchers. This recommendation was also explicitly mentioned by both Nettelbeck and Thurn. Nettelbeck mentioned it as an unsolved problem that should be addressed in the near future.

An influential audience is the sixth pillar for cross-disciplinary success. Contrary to disciplinary scholars, who traditionally have themselves as the primary audience, cross-disciplinary researchers are often lacking a clearly defined audience. Rayner argued, that no matter how intriguing the research problem or its potential outcome, it is not likely to proceed very far or fast unless the participants see themselves as addressing an audience that could act on it. Since no one likes to perform to an empty theatre, identifying an audience that can act on the research is an important ingredient in its success. This argument was supplemented by Thurn, who argued that research fellows in a problem-oriented research unit will find that their success depends not only on the integration of their work into the overarching research program, but also in the recognition of their achievements by an external peer group. This tension between inward and outward orientation will be stronger the more the type of research undertaken in a given institution deviates from “normal” research done elsewhere.

Having experienced weaver (interdisciplinary specialists) on the team is the seventh pillar for interdisciplinary success.. Rayner argued, that prior experience with operational problems and challenges of building collaboration across disciplinary boundaries is needed. Other essential management abilities are conflict resolution and an ability to keep people engaged when they become frustrated with other participants. Furthermore it is a matter of being aware of and able to make the initial connection between threads that have been spun in isolation from another. As mentioned earlier in this discussion, the role is often pastoral or therapeutic as much as it is intellectual and scholarly. In this respect it is very much in the realm of craft skill, and is often hard to evaluate. In addition to these personal abilities, Scheuermann recommended the use of a number of management instruments with a specific focus on information and communication. A related recommendation was a high degree of flexibility in the management of cross-disciplinarity. This flexibility was explicitly and implicitly mentioned in a number of the contributions.

The last recommendation, that will be mentioned here, came from Roggenhofer, and it aimed at the changing situation for researchers. Roggenhofer argued, that throughout Europe it is a common practice to grant sabbaticals to university researchers, also in the industry sabbaticals for researchers become more and more common. Up to now, sabbaticals are generally used in an individualistic way, leaving it entirely to the single researcher what to do with her or his spare time. It should be considered whether something like ”teamwork sabbaticals” should be supported by the EU, where researchers from different EU countries and also different disciplinary background could apply for a common working sabbatical. He argued, that the exchange programs and guest-professorships now common often suffer from the high load with academic duties both of the host and the guest. Teamwork sabbaticals would offer the chance to do common research work under optimal working conditions and could almost automatically secure an intensive interaction

between researchers from different countries and with different scientific background. This could be considered as a further step towards an integrated European research landscape.

Concluding comments

This final recommendation points towards the third and last MUSCIPOLI workshop, where structural issues will be the theme. The workshop, which will be held in Athens in October 2002, will address the uncertainties related to the *Building of European Research Capacity.*

This internationalisation of research is closely related to the topic of this workshop, where the issue was addressed in a number of the contributions. Internationalisation is often an associated objective to cross-disciplinary initiatives, but the issue was not a main focus point in this report. Instead internationalisation of research as an aspect of the management with uncertainty in science policy will be explored in more depth in the coming final workshop.

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Appendix

In this appendix an example of a cross-disciplinary project is presented by one of the participants from the workshop; Dr. Astrid E. Schwarz from Technische Universität München. The project “Handbook of Ecological Concepts” is made in collaboration with Maison des Sciences de l’Homme in Paris.

Handbook of Ecological Concepts (HOEK)

Dr. Astrid E. Schwarz
Technische Universität München
Lehrstuhl für Landschaftsökologie

Abstract

The projects objective is to write a philosophically and historically informed handbook for people interested in ecology and in the wider realm of environmental research and management as well as for people in the area of environmental policy making. Explicitly, the *Handbook of Ecological Concepts* does not intend to give short „technical“ definitions for the concepts in question, but to outline the historical, logical and semantical processes that link a given concept with its object. Consequently, the discussion of the concepts in question has to be worked out in an epistemologically reflected space and in this respect the *HOEK* is also engaged in research activity. Imperatively put forward by its scope, the *HOEK* has to be an international and interdisciplinary project. It needs both support and contributions from the scientific community as well as the public.

Problem statement

Complaints about woolyness, lacking transparency, incomprehensible terms run through ecology and related fields e.g. environmental studies or human ecology. The negative consequences of these deficits are visible both in basic research as in the various fields of its application. In basic research ambiguous terms lead to problems in theory formation and in the ability to communicate about the theories. In the course of the application of ecological theories in environmental protection and biological conservation the unconscious or neglected conceptual deficits become multiplied and lead to difficulties in the communication about the objects of conservation as well as in the identification of adequate management strategies.

The innovative character of the proposed *Handbook* is to allow for a quick access to the (sometimes multitude) conceptual contents of the term and in addition provide in depth-information about their socio-political and historical context. The *Handbook* is conceptualized both for use within scientific realm of biology and other disciplines, as for a more extended interested public, in particular for the large number of users of ecological knowledge in the fields of environmental protection, conservation, agriculture, forestry, etc.

Aim of the HOEK

The intention of the *Handbook* is to clarify the historical and actual meanings and uses of ecological terms. This implies to provide information about the originally intended conceptual meaning of ecological terms and about their specific historical meanings which are fundamental for decisions about the correctness of understanding and the uses of these terms. We do not intend either to establish a conceptual historism or a normative fixation of meaning, or to suggest specific trajectories for the definition of concepts. Instead, awareness of the terminology should be enhanced that is the terms are intended to connect concepts and factual objects. In this fashion, traditional or recently developed terms are not arbitrarily defined by

individuals or by the current scientific community. Rather they carry meanings and denote contents and intentions, which are the result of their generation and their historical use. Thus, an arbitrary use is as inadequate as a dogmatic definition. The appropriateness of concepts must in addition be measured against a methodology which is sound from the perspective of the philosophy of science and against the usefulness of the concepts in empirical practice.

Set-up of the HOEK and way of procedure

To achieve the description and analysis of concepts described above requires a historical-philosophical approach and at the same time a sound knowledge of the technical basis of ecology and its fields of application. This necessitates an interdisciplinary approach. The project includes reviewing the history of origin and use of the concepts, explanation of the interdependence and functionality within their conceptual and categorial system and contextualizing. Form and content of the project shall both meet demands of primary research and provide a quick guidance in respect to the particular concepts. From the descriptions outlined above it follows that the task of the *Handbook of Ecological Concepts* can not be to treat a large number of purely technical terms, but that it will only deal with fundamental terms with theoretical relevance. The number of terms is thus limited to approximately 80. These are arranged in so-called **conceptual fields** (e.g. ecological units), that allow for an overarching structure regarding the content. The *Handbook* is not arranged in an alphabetical order but according to the roughly 10 conceptual fields characterized by a keyword index laid out in advance. This approach guarantees conceptual openness and flexibility.
The typical discussion of one concept will cover about 20-30 pages. It is planned to run the project over a time period of about 7 years, with a volume completed yearly. Every volume will cover at least one conceptual field.

All articles will follow a common **scheme** which comprises **6 parts**:

1. The article head always consists of a literal translation of the concept and of the different existing language forms (at least in English, French and German).
2. The sources of the first use of the concept in ecology will be given; description of the ethymology including the pre- and extraecological uses of the term.
3. The main part of the treatment of each keyword is subdivided into severeal subheadings.
   3.1. Short summary of the whole article;
   3.2. Main phases of the history of the concept;
   3.3. Eventually a short sketch of epistemological changes and influences.
4. Detailed explanations of the main elements as described in 3.; related aspects will be treated staying close to the core of the specific concept; cross reference to problems occuring in the usage of the concepts outside of ecology, e.g. in environmental protection and biological conservation.
5. Sources and literature.
6. Comments by other authors on the article.

The first five parts will be covered in every article. With the sixth part, the conceptual openess of the *Handbook* is also included on the level of contents. As any author will by himself or herself be responsible for the contents of her/his article, an institutional possibility for commenting and supplementing of articles by other authors is provided.

Readers may thus use the *Handbook* both as an extensive and far-reaching source of information about the particular keywords or they may gain a concise overview in reading parts 1, 2 and 3 which however, will still go far beyond that provided by conventional dictionaries of ecology.

Institutional organization

The editors of the HOEK are Astrid E. Schwarz and Kurt Jax. The editors play a pivotal role in the commission of the articles. A committee of reviewers (editorial board) chosen from various disciplines guarantees the qualitative standard of the interdisciplinary orientation of the articles. The editors themselves participate as authors in the project. Every author signs his article with his name and is ultimately responsible for the contents, which can also be contrary to the opinion of the editors (see above).

The *Handbook* is welcomed by Prof. Dr. Ludwig Trepl (Lehrstuhl für Landschaftsökologie, Technische Universität München), who is also a member of the editorial board. The Maison des Sciences de l'Homme (Paris) is acting as an associated partner of the project.

The *Handbook of Ecological Concepts* will be published by Kluwer Academic Publishers, the publication of the first volume can be expected on June 2004.

List of contributors

Kaare Aagaard
The Danish institute for Studies in Research and Research Policy
Finlandsgade 4
8200 Aarhus N, Denmark
ka@afsk.au.dk

Denis Bouget
The Maison des Sciences de l'Homme in Nantes
Université de Nantes
Chemin la Censive du Tertre
Bp. 52231
44322 Nantes Cedex 3, France
denis.bouget@sc-eco.univ-nantes.fr

Hinnerk Bruhns
Directeur de recherché au CNRS;
Adjoint a l'Administrateur
Maison des Sciences de l'Homme
54, boulevard Raspail
75270 Paris Cedex 06, France
bruhns@msh-paris.fr

Chris Caswill
Director of Research ESRC
ESRC, Polaris House
North Star Avenue,
SN2 1UJ Swindon, UK
chris.caswill@esrc.ac.uk

Ingeborg Mehser
Hanse Institute for Advanced Study
Lehmkuhlenbusch 4
27753 Delmenhorst, Germany
imehser@h-w-k.de

Joachim Nettelbeck
Secretary of the Wissenschaftskolleg Berlin
Institutes for Advanced Study (IAS)
Wallotstrasse 19
14193 Berlin, Germany
jn@wiko-berlin.de

Basarab Nicolescu
Theoretical Physicist at CNRS, University of Paris 6
Member of the Romanian Academy
President of the International Center for Transdisciplinary Reasearch (CIRET)
19 Villa Curial, 75019 Raris, France
nicol@club-internet.fr

Manfred Niessen
Director of the Division for Humanities and Social Sciences
Deutsche Forschungsgemeinschaft
Kennedyallee 40
53175 Bonn, Germany
manfred.niessen@dfg.de

Ed Page
Professor at LSE, Director of the ESRC "Future Governance Program"
London School of Economics and Political Science
Houghton Street
London WC2A 2AE
e.c.page@lse.ac.uk

Steve Rayner
Professor of Science in Society,
Director, ESRC Science in Society Programme
Said Business School, University of Oxford,
Park End Street
Oxford, OX1 1HP, UK
steve.rayner@said-business-school.oxford.ac.uk

Johannes Roggenhofer
Secretary of ZIF-
Zentrum für Interdisziplinäre Forschung
Universität Bielefeld
Wellenberg 1
33615 Bielefeld, Germany
johannes.roggenhofer@uni-bielefeld.de

Dr. Michael Scheuermann
Department of Psychology, University of Freiburg
& Knowledge Media Research Center, Tübingen
KMRC - Knowledge Media Research Center
Konrad-Adenauer-Str. 40
72072 Tübingen, Germany
m.scheuermann@iwm-kmrc.de

Dr. Astrid E. Schwarz
Technische Universität München
Lehrstuhl für Landschaftsökologie
Am Hochanger 6
85350 Freising, Germany
or
Maison des Sciences de l'Homme
c/o secrétariat scientifique
54 Bd Raspail
75006 Paris, France
aschwarz@msh-paris.fr

Karen Siune
Director
The Danish institute for Studies in Research
and Research Policy
Finlandsgade 4
8200 Aarhus N, Denmark
ks@afsk.au.dk

Domenico Rossetti de Valdabero
DG Research (EU), Programme Energy
European Commission, Research DG
(Energy Programme),
Rue Montoyer 75 7/1
1049 Brussels, Belgium
domenico.rossetti-di-valdalbero@cec.eu.int

Georg Thurn
Wissenschaftszentrum Berlin (WZB)
Section Research Planning and –Coordination
Reichpietschufer 50
10785 Berlin-Tiergarten, Germany
thurn@medea.wz-berlin.de / thurn@wz-berlin.de

MUSCIPOLI - Managing with Uncertainty in Science Policy

Introduction to MUSCIPOLI

MUSCIPOLI is based on a proposal to EU Fifth Framework Programme; Strategic analysis of specific political issues. Programme "Improving the Human Research Potential and the Socio-Economic Knowledge Base", "Support for the development of science and technology policies in Europe".

Proceedings from MUSCIPOLI Workshops

Science Policy - Setting the Agenda for Research
Proceedings from MUSCIPOLI Workshop One, September 2001, Denmark.

The design and delivery of inter- and pluri-disciplinary research
Proceedings from MUSCIPOLI Workshop Two, August 2002, France.

Proceedings and Danish Summary is published on: http://www.afsk.au.dk/muscipoli.htm

Workshop Three will be held in Athens, Greece, 9-11 October 2002.

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The MUSCIPOLI group has identified a number of activities, under the heading of Managing with Uncertainty in Science Policy. These include: three international workshops: Priority Themes and Topics, Support for Transdisciplinary Research, and Building European Research Capacity, handbook of policy guidelines based on experiences from a series of workshops.