Changes in and around science – their dynamics and their evaluation

Tensions between the New Governance of Science and Ongoing Recontextualisation of Science • Background Paper for Thematic Workshop 2

Authors

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Workshop Programme

- **Thursday 3 May**

12.00	**Arrival** and lunch
13.00	**Welcome, Round of Introductions**
13.30	**Summary and comments to theme paper**
14.00	**First Session**
	Andy Stirling: Sites of recontextualization and the dynamics of opening up and closing down
	Olivier LeGall: Experiences on the workfloor
	Discussion, including further comments from participants
16.00	**Break**
16.30	**Second Session**
	Jochen Gläser: Studies of new governance of science
	Discussion and further comments
18.30	**End of Day 1**
19.45	**Dinner**

- **Friday 4 May**

09.00	**Third Session**
	Jack Stilgoe Experiments in recontextualization, a personal journey
	Ulrike Felt: Anticipation and imaginaries
11.00	**Break**
11.30	**Fourth Session**
	Andrea Bonaccorsi Overall diagnosis, own experiences in committees etc in Europe and in Italy
12.30	**General discussion and outlook**
13.30	**End of meeting** and lunch

Workshop Participants

Jean-Pierre Alix | National Centre for Scienctific Research (CNRS), France | *ESF Member Organisation Forum on Science and Society Relationships*

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Background

In the letter of invitation a broad theme was formulated: There are changes in the uptake of scientific research, up to commodification, but there is also interaction with new kinds of actors like patient associations. Both are features of what has been called 'recontextualization' of science in society. At the same time, there is new governance of science, up to use of indicators of performance. All this is embedded, on the one hand in changes in modes of knowledge production, on the other hand in expectations and imaginaries about science in society. These changes call for analysis in terms of their dynamics, as well as diagnosis of their impacts and desirability.

Furthermore, a *tension* is suggested between the two components of the broad theme, recontextualization and new governance. This tension will be the red thread in our theme paper. It may need to be nuanced; that will be one of the outcomes of the workshop.

Actually, these topics were already highlighted in the proposal for the forward look project, and a visualisation was offered. This visualisation is an attempt to highlight important changes, how these relate, and how they are embedded in broader contexts and trends – including tensions.

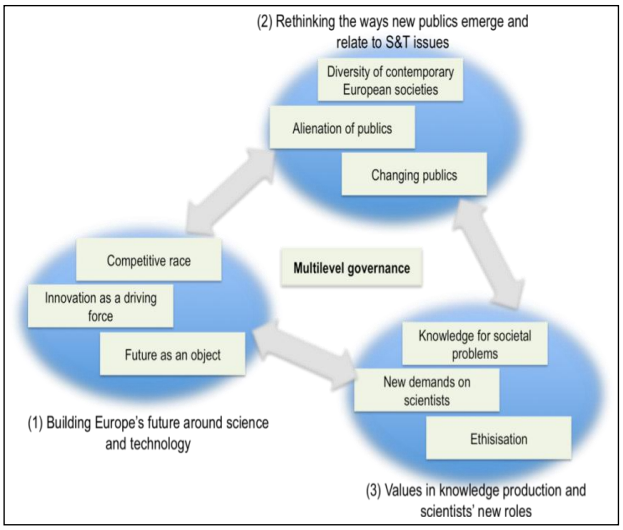

Figure 1

The MASIS Report (Markus et al. 2009) summarizes many of the tensions:

""The revival of excellence of science as a goal, reinforced by the establishment of the European Research Council, provides an occasion for international competition, and for performance indicators based exclusively on publications in ISI-indexed journals. At the same, there are calls for increased democratization of science, concretely, the involvement of more stakeholders. More stakeholders, and existing stakeholders in new roles, are involved." "There are also developments in the governance of science in society. The governance of scientific institutions is under pressure, not least because of different contexts of governance, simultaneously pushing innovation, democratization and scientific integrity. New forms of governance are emerging: the discourse on responsible development, including attention to ethics and codes of conduct; interactive forms of technology assessment; and experiments with public engagement. Again, these are not without tensions, but they indicate that we do not have to fall back on traditional forms of governance." (Markus et al. 2009, 4-5)

This provides the background for the present theme paper. The paper has three aims:

- **to introduce the key issues**, mobilizing relevant literature, so that there is no need for our speakers to go into the basics – unless they want to disagree with what we wrote, of course;
- **to discuss further insights and challenges**, including the idea of an overarching tension between recontextualisation and the present new governance of science;
- **to formulate questions** that we may want to focus on in our discussions, and perhaps reach some shared responses about.

Introduction

There is a plethora of attempts to diagnose ongoing changes. What they share is first, a view of a relatively stable "social contract" of science and society, a settlement that became visible in the early 1950s and was sometimes labelled as "Science, The Endless Frontier", after the title of Vannevar Bush's 1945 Report to the US President. Underneath that overall settlement, further developments occurred (the 1957 Sputnik shock in the West, the recognition of Big Science as an issue, concern about the embroilment of science in the military-industrial complex), but the contract remained in place until the 1970s. It was undermined (or from another point of view, opened up) through the combination of the critical movements at the time (which also called for more relevance) and by the late 1970s the policy interest in science-driven innovation to refuel economic growth, as well as science speaking to 'grand challenges' (to use, anachronistically, a recently popular policy phrase). Science was now seen as a strategic resource, and to be supported in those terms. Indicative is the emergence of 'strategic research' as a category of basic research (Irvine and Martin 1984): Strategic research is basic research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems.

Actually, a regime of Strategic Science is emerging, replacing – or grafted on – the regime of Science, The Endless Frontier (Rip 2002, Rip 2011a). As a social contract, it is carried by an alliance between politicians and science policy makers on the one hand, and a new elite of scientists promising to contribute to wealth creation and sustainability, on the other hand. At the same time, markets for strategic research have come into being, starting with national strategic R&D programs in the 1970s and 1980s and the EU Framework Programs since the 1980s.

The second shared view is that the 1980s (running on into the 1990s) constitute a transition period, a 'saddle point' as Ulrich Beck's research group on reflexive modernization has phrased it (cf. Beck et al. 2003). The question then is what happens after the 'saddle point'? That is where differences in the diagnoses become visible. In this introduction, we will briefly discuss the diagnoses that are prominent in the literature. We consider what has been happening since the 1980s, and how we can understand and evaluate it, in the further sections of this theme paper. We will focus on recontextualization of science in society and the new governance of science, and the tensions involved. There is more that is relevant for our workshop discussions. For example, the embracing of new technosciences like biotechnology and nanotechnology to further feed science-driven innovation, which then also backgrounds other types of innovation based on collective experimentation (see Joly et al. 2010 for this point). Intriguing also is how an earlier movement towards public engagement is now becoming part of a move towards responsible research and innovation (at least in policy discourse). The MASIS Report (Markus et al. 2009) was an attempt to collect and evaluate what is happening with science in society, but it may have to be updated. We may do so in our discussions in the workshop. In this theme paper we limit ourselves to the topics of anticipatory coordination and imaginaries, striking features of present science and science governance.

Broadly speaking, four types of diagnoses are discussed in the regular science studies and science policy literature:

One type of diagnosis responds to ongoing changes and tries to come to terms with them. Early examples include Ravetz on post-normal science and Ziman on steady-state science. The overall idea of recontextualisation of science in society (cf. also Nowotny et al. 2001) is such a diagnosis. Specific issues like 'third mission' of universities and the need to assess (also prospectively) extended impacts of scientific research,[1] are loci where recontextualization is occurring (and struggled with).

A second type of diagnosis inquires into underlying changes. There is the (by now classic) claim of a new mode of knowledge production (Gibbons et al 1994, Nowotny et al. 2010).[2] There is also Bonaccorsi's analysis of a new, distributed 'search' regime of knowledge production, with implications for institutions of science (Bonaccorsi 2008, see also Bonaccorsi 2010).

[1] This is an operationalization of the broadly felt need to consider impacts, also in strategy documents like INRA (2010).
[2] See Hessels and Van Lente (2008) for an overview and for a discussion of the reception of the Gibbons et al. (1994) claim about a new mode of knowledge production.

Thirdly, the approaches of Triple Helix (cf. Etzkowitz and Leydesdorff 2000) and National Systems of Innovation (cf. Lundvall 1992) are sometimes presented as diagnoses about the changes, e.g. about increasing importance of interactions between universities, government and industry. But they are primarily mapping tools; the only diagnostic element is that it is important to map university-government-industry interactions and system level dynamics.[3]

Fourthly, approaches in terms of "regimes of production of S&T knowledge in society" (Pestre 2003) converge with analysis of neo-liberalisation of science (Lave, Mirowski and Randalls 2010) and "academic capitalism" (Slaughter and Rhoades 1996) to point out changes in co-production of science and politics related to the neoliberal turn that started in the late 1970s. In a nutshell, this underlines the growing influence of regulation of scientific production by markets (under the aegis of extension of property rights but also commodification of higher education) and by civil society (social movements, patients associations, legal arenas, etc.) (Gaudillière and Joly 2009).

Such analyses can be an input in the debate on the "Knowledge Economy" after the Lisbon Agenda (of March 2000) and its recent incarnation in the "Innovation Union 2020" policy paper. Felt and Wynne (2007) argue that such policy discourses construct a vision of the relations between science and its publics where society is the problem and science (and innovation) is the solution. It is important to analyse why, despite its limitations, the core of this European policy for science and higher education remains unchanged.

Generally, the diagnoses that have been offered in the literature need not be seen as alternative explanations of what is happening. They are different cross-sections of a complex picture, and can be entertained together. For example, one might inquire into how the political economy of science (fourth set of diagnoses) is co-evolving with changing dynamics of scientific knowledge production (second set of diagnoses) and institutional changes (first and third set of diagnoses).

Recontextualisation

The concept of 'recontextualization of science in society' appears in Nowotny et al. (2001), and was taken up more broadly in the EU MASIS Expert Group's Report (Markus et al. 2009). It can be visualized in a diagram showing the two components of this diagnosis (Rip 2011a): first, how the "core business" of science since the late 19th century (cf. Gibbons et al. (1994) on Mode 1) is increasingly recontextualized, leading to successive layers of institutions (e.g. strategic research programmes from the 1970s onward), and second, an overview of recent boundary interactions and their nature, which may, over time, lead to a further layer.

This diagram focuses on the growing influence of civil society actors, through engagement with research, contestations, science in the media, science in the court, etc. This adds up to an important trend: de-professionalisation of scientific knowledge production together with (proto-) professionalization of the new actors involved (cf. also Neubauer 2006). The latter may be more important than the discourse of democracy (cf. Callon, Lascoumes and Barthes 2009).

Another part of recontextualisation of course is what is now called 'valorization' of science, in particular valorization in terms of commercialisation of research results. Commercialisation is not new, but its being taken up as a policy goal for science is. New practices have to evolve, including rules that are not part of the traditional ethos of science.

Research universities and research funding agencies are sites where recontextualization is played out. There are dynamics of development specific to research universities and funding agencies, respectively, which are interesting in their own right, but appear here as one component in how concrete types of institutions struggle with recontextualization of science in society.

[3] It is possible to do better, but then the National System of Innovation approach has to include more complexity, the actual dynamics of development. An interesting approach to do so is to look at countries of the global South (Delvenne and Thoreau 2012).

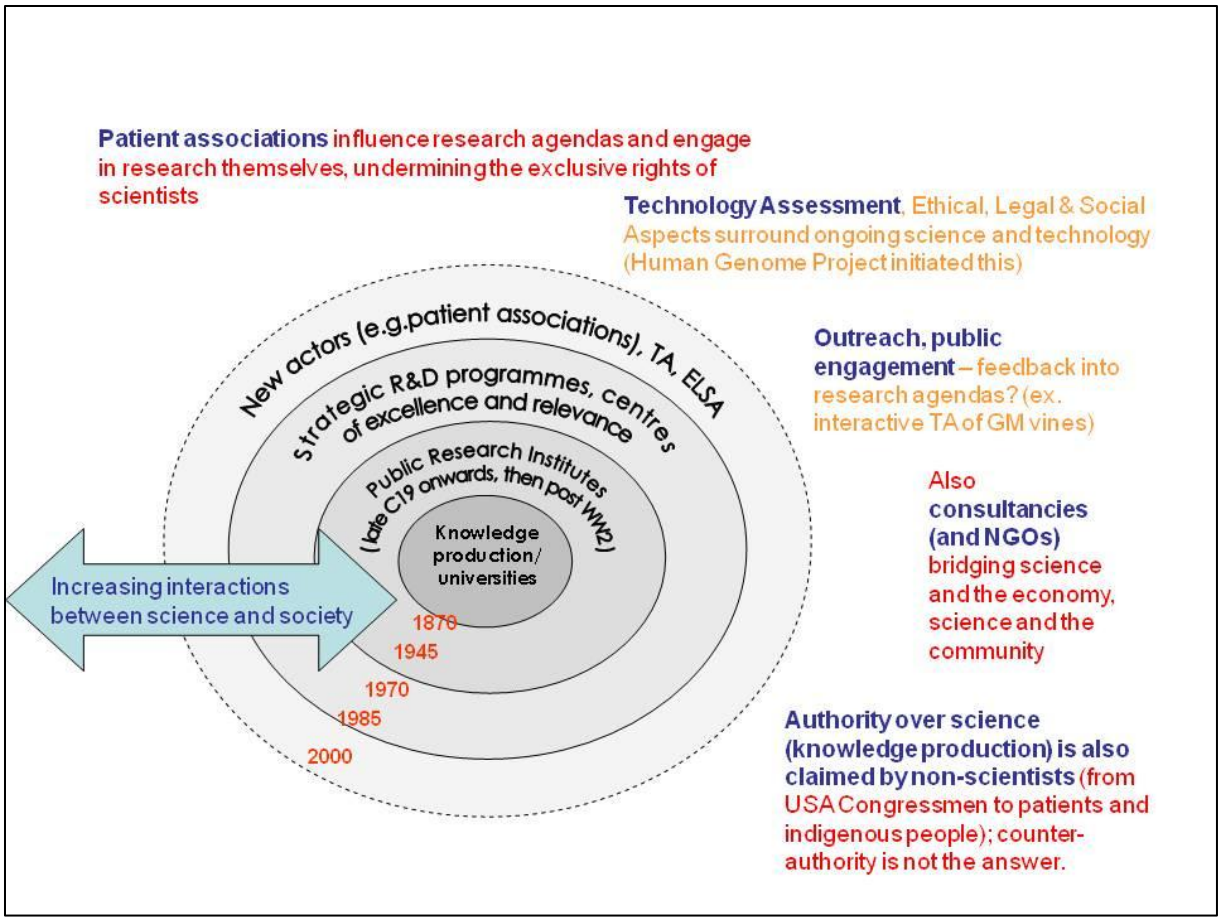

Figure 2

One can continue this analysis by looking at less institutionalized sites of recontextualization, and general patterns of 'opening up' and then 'closing down' again, but in new forms (cf. Stirling 2009).[4] In terms of governance, it is an uneasy combination of governance from within and governance from the outside (Smith and Stirling 2007).

New governance

The new style of managing public organisations, New Public Management – itself part of a general transformation of contemporary capitalism (cf. Boltanski & Chiapello 1999) – , is being taken up in the governance of universities and research organisations. The typical elements of New Public Management are (Paradeise 2012):

- it proposes accountable autonomy for (and self-governance of) the organisation instead of hierarchical subordination;
- the "performance" of the organisation is measured on regular bases and these measures are used for resource allocation;
- this approach requires operational tools at each level to evaluate the quantity and quality of outputs and their impacts. This is the role of "performance indicators" which function as "quasi-prices", i.e. they create a space of commensurability that makes it possible to compare any organisation in the same field of activity. Evidence-based management provides the basis for the control and evaluation of organisations and policies on the "objectivity "of the measurement of quasi-prices that are supposed to benchmark and sanction performance.

[4] Such an analysis can build on Andy Stirling's on diversity, opening up and closing down in general, as in technology appraisal (Stirling 2008) and environmental transitions (Stirling 2011).

By combining the two values of transparency and accountability, this form of governmentality (conduct of conducts) replaces direct injunctions with mechanisms that lead the organisational actor to assume the computability of its behaviour by systematically influencing the conditions of its action (Altfeld & Miller 1984, Rose 1991). This is particularly visible in the importance accorded to (and thus also the quest for tools) measuring the quantity and quality of scientific production on the basis of publications and of their scientific impact. An extreme version are the rankings of academic institutions, which constitute benchmarks for national policies and for organisations' strategies, despite their acknowledged very poor quality (Gingras 2008, see also Rip 2011b).

From the side of scientific establishments, there is grumbling accommodation to the new pressures. Illustrative are these quotes from a meeting of "the world science leaders" in Jerusalem, October 1994. The science leaders were defensive, but prepared to defend the bastion of science. And: "if we do not measure ourselves, somebody else will - "upper management," the government, funding agencies, whoever - and they will probably do an even worse job of it." (Asher et al. 1995) Since then, university boards, in their race for excellence, have been pushing their staff to perform in terms of indicators. It is actually a multi-level issue, with university managers and funding agencies contributing, in addition to government Ministries responsible for science. There are now also dedicated agencies for evaluation.

The new governance of science raises a number of questions. To begin with, despite the straightforward underlying logic, national negotiations involve political compromises and lead to heterogeneous implementation (Gläser 2007). Taking into account this diversity, one may wonder what the implications of these changes are on the life of scientists and on their actual performances. A number of sociological and ethnographic analyses show that the effects are ambivalent and that they are mediated by collective organisations like research groups, research departments, etc. (e.g.: Felt et al. 2011, Barrier 2011). And of course, there are the questions about the validity of quantitative indicators and about their responsible use.

The new governance of science is positioned as opposed to own dynamics of science. But there is also interaction between ongoing work, promises and priority setting. From the perspective of the state (and society), it is a question how to get science working on, and delivering, what the state/society would like to have. From the point of view of science, it is a matter of mobilizing funds (and other traditional policy for science considerations). And the two interact, and new terms are created, like frontier science and grand challenges. All this constitutes a further governance dynamic.

There are two types of interaction, starting with scientific opportunities or with societal issues and demands on science. Illustrative is how the UK Research Councils have defined and outlined [ten] Grand Challenges (RCUK, 2009), some in a technology-push or scientific-opportunity-driven mode, others in a society-pull or social-problem-driven mode.

NanoScience through Engineering to Application

Nanotechnologies can revolutionise society. They offer the potential of disruptive step changes in electronic materials, optics, computing, and in the application of physical and chemical understanding (in combination with biology) to generate novel and innovative self-assembled systems. The field is maturing rapidly, with a trend towards ever more complex, integrated nanosystems and structures. It is estimated that by 2015 products incorporating nanotechnology will contribute US$1 trillion to the global economy, and that the UK has a 10 percent share of the current market. To focus the UK research effort we will work through a series of Grand Challenges. These will be developed in conjunction with researchers and users in areas of societal importance such as energy, environmental remediation, the digital economy, and healthcare. An interdisciplinary, stage-gate approach spanning basic research through to application will be used. This will include studies on risk governance, economics, and social implications.

Ageing: life-long health and wellbeing

There is an unprecedented demographic change underway in the UK with the proportion of young people declining whilst that of older people is increasing. By 2051, 40 percent of the population will be over 50 and one in four over 65. There are considerable benefits to the UK of having an active and healthy older population with potential economic, social, and health gains associated with healthy ageing and reducing dependency in later life. Ageing research is a long standing priority area for the Research Councils. The Research Councils will develop a new interdisciplinary initiative (£486M, investment over the CSR period involving all seven Research Councils) which will provide substantial longer term funding for new interdisciplinary centres targeting themes of healthy ageing and factors over the whole life course that may be major determinants of health and well being in later life. Centres will be focused on specific research themes drawing on the interdisciplinary strengths of the Research Councils, such as Quality of Life, Physical Frailty and Ageing Brain.

Anticipation, imaginaries, and the shaping of temporal orders

An important cross-cutting issue is anticipation, as in the more or less open-ended promises about scientific opportunities, but also in how policy has to anticipate, precariously, to define its approaches and priorities. This was already emphasized in the proposal for the Forward Look workshops:

"The past decades of discussion, on research and policy-making on science-technology-society issues, can be characterised by the increasing attention given to anticipating, transforming and/or controlling futures. This has become visible through massive investments in the development of anticipatory methods such as technology assessments and foresight exercises (including the building of complex science-society scenarios). Many of these exercises are premised on the belief that it is possible to control the uncertainty inherent in the future, at least to some extent.

This tendency to use the future to shape the present has gained currency in the debates surrounding the recent 'Innovation Union 2020' communication from the European Union, in which European innovation is depicted as being key to Europe's future. Only through a specific kind of innovation policy now, the narrative runs, is there any hope of establishing a strong and sustainable model of growth by 2020."

Also later, on the sense of urgency that is invoked in policy documents and discussions:

"It is necessary to understand better whether (or to what extent) the feeling of acceleration, speed and the lack of adaptive capacity is a question of framing and perception or whether it can be grounded in specific empirical observations. Where did the discourse of a society that cannot keep up with the speed of technological development originate and where does it develop further? What model of the relation between S&T and society is implied when talking about acceleration and urgency? And in which ways does this perceived need for acceleration and the urge to act make it difficult or impossible to allow what has been labelled an 'no sin to delay benefit'-thinking in the policy arena?"

This definitely has to do with the perception of being involved in an innovation race (in the case of high technoscience, often reduced to a funding race, as in the case of nanotechnology).

Anticipation and anticipatory coordination are not just a matter of policy instruments. There is a deeper level that can be brought out by considering the phenomenon of imaginaries, a feature of late-modern societies. Compare this quote from Arjun Appadurai (1996):[5]

"The image, the imagined, the imaginary—these are all terms that direct us to something critical and new in global cultural processes: the imagination as a social practice. No longer mere fantasy, no longer simple escape, no longer elite pastime, and no longer mere contemplation, the imagination has become an organized field of social practices, a form of work (in the sense of both labor and culturally organized practice), and a form of negotiation between sites of agency (individuals) and globally defined fields of possibility. The imagination is now central to all forms of agency, is itself a social fact, and is the key component of the new global order."

[5] Quoted from Fujimura (2003), at p. 176.

Imaginaries can be individual (that was the original use of the term, to capture the voices of scientists, see Marcus 1995), but for our purposes, imaginaries are shared narratives that are also embedded in decisions, investments and institutions, and thus shape further activities and policies.[6] Imaginaries emerge and sediment and can become powerful. They are about the future, but not in the way that professional foresight addresses the future. Jasanoff and Kim (2009) analyzed sociotechnical imaginaries of nuclear power in US and South-Korea: containment, and atoms for modernization/development, respectively. Their definition of imaginaries focusses on projects: "We define national sociotechnical imaginaries as "collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects.""(at p. 120)[7] For our discussion in the workshop, we look at institutions and policies more than at projects, and need not emphasize the national and comparative aspects.

Key questions then are about the nature of these imaginaries and their hold on perceptions and actions; their critical evaluation; and about possibilities to do better than just follow the dominant imaginaries.

The phenomenon of anticipatory coordination has become more important with increasing policy and strategic interest in new advanced technologies, biotechnology and recently nanotechnologies being prime examples (cf. Joly et al. 2010). Their promise becomes part of the context of concrete innovation journeys. And some of the coordination work is actually done by the promises, as they mobilize actors. Thus, there will be some shaping of technological development, and this will become stronger when there is institutionalization of anticipatory coordination as in the European Technology Platforms. Anticipatory coordination is an attempt to project a path into the future, which is to be co-produced by concerted action of the various actors. The projection is presented as having a certain inevitability to it, and may actually work as a self-fulfilling prophecy.

The self-fulfilling prophecy element is visible (and actually aimed for) in the institutionalised roadmapping exercise in the semi-conductor sector (the International Semiconductor Technology Roadmap, now also going "beyond Moore's Law"). The European Technology Platforms, an instrument of the European Commission's technology and innovation policy, can evolve to become informal consortia for coordination of strategies. This is visible in ENIAC, the European Nanoelectronics Initiative Advisory Council, a consortium in its own right but recognized by the European Commission, and now moving on to become the equivalent of a Joint Technology Initiative.[8] The Platform on NanoMedicine, led by directors of the relevant divisions of Philips and Siemens, draws on the strong interest in nanomedicine, but has not yet built a tradition of anticipatory coordination. It is still only a space in which new interactions occur, with little or no entanglement leading to dynamics of its own.

The key to formal and informal anticipatory coordination are spaces for interaction where actors can mutually position their activities and strategies in relation to possible and emerging paths. Such spaces can emerge within ongoing entanglements, opening up, as it were, but also after a time closing down.[9] Important for the productivity of spaces around new and emerging science and technology is the role of a public or semi-public actor offering room for interaction between private actors; this has been very visible in European Union Framework programs and projects (Edler 2000). A further important aspect is the role of linking-pin and other institutional entrepreneurs (Te Kulve 2010).

[6] There is a lot of work/analysis in terms of imaginaries in geography, urban studies, health care studies.

[7] Jasanoff and Kim (2009, at p. 123) elaborate this further: *"Imaginaries, in our view, are not the same as policy agendas. They are less explicit, less issue-specific, less goal-directed, less politically accountable, and less instrumental; they reside in the reservoir of norms and discourses, metaphors and cultural meanings out of which actors build their policy preferences. Neither are imaginaries simply master narratives that justify scientific or technological investment, such as the pervasive modern narrative that equates science with progress. Unlike master narratives, which are often extrapolated from past events and serve explanatory or justificatory purposes, imaginaries are instrumental and futuristic: they project visions of what is good, desirable, and worth attaining for a political community; they articulate feasible futures. Conversely, imaginaries also warn against risks or hazards that might accompany innovation if it is pushed too hard or too fast. In activating collective consciousness, imaginaries help create the political will or public resolve to attain them."*

[8] ENIAC is led by the big incumbents in the sector, and through its members also coordinating with their North-American and East-Asian counterparts. It has now evolved into the ENIAC Joint Undertaking, dispensing R&D funds. See www.eniac.eu

[9] This resembles de-alignment and re-alignment, but need not be linked to the introduction of a specific technological novelty; see for example Stirling (2008).

Overall questions and challenges

We highlight some questions that follow from the preceding discussion, occasionally adding further queries. These questions can be referred to in the workshop discussions, and we propose to come back to them in the concluding session, at the end of the Friday morning.

- Recontextualisation can be seen as opening up of science, but actual recontextualisation includes specific closing down as well. These dialectics work out differently in different domains and contexts.
- Is the feeling of acceleration, speed and the lack of adaptive capacity a question of framing and perception (and if so, to what extent) or are there are changes out there, which can be grounded in specific empirical observations?
- Imaginaries and the recent policy discourse of 'grand challenges' bridge the overall tension. But more important might be what happens on the various work floors, also in agencies of the science system, and in committees and panels.
- The recent buzzword: dialogue of science and society (cf. Danish EU Presidency Conference, April 2012), risks re-instating the distinction between science and society, while entanglements and blurring are what is happening.
- New governance (new public management) can be perceived as intrusion on science, but is also a way to stimulate new directions.
- The European Research Area, the European Knowledge Society, and now the Innovation Union, are specific parts of attempts to re-imagine Europe (social capitalism now under pressure by the crisis; diversity and its ambivalences). ERA was successful in opening up spaces, while the European Knowledge Economy/Society, as operationalized in the Lisbon Agenda, is a failure. But the general idea could be taken more seriously (cf. Felt, Wynne et al. 2007). The Innovation Union, in spite of its reference to social innovation, appears to pursue the neo-liberal agenda. What would be an alternative road to go?
- Given the tensions, struggles and ambivalences, governance of science, technology and innovation should not be seen as a question of which governance arrangements to devise. Open, dynamic (or tentative) governance of science in society is in order. And it should take into account the multi-level dynamics that occur.

The further challenge is to translate these observations, analysis and diagnosis into action. For our eventual report, it would be a matter of recommendations for action. Any such recommendation for action would imply a reduction of complexity. We have to accept that, but check whether this is a productive reduction of complexity.

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