EUROPEAN SCIENCE FOUNDATION

Science Culture: 'Science in Society' issues and the scientific community

'Science in Society' issues and the scientific community ● Background Paper for Thematic Workshop 3

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Workshop Programme

- **Monday 18 June**

12.30	**Arrival** and lunch
13.30	**Welcome, Round of Introductions**
14.00	**Daniel Barben & Alan Irwin** Science Culture: 'science in society' issues and the scientific community
14.45	**Martina Merz** Disunities and tensions: scientific cultures today
15.45	**Break**
16.15	**Marcela Linková** Excellence and its Others: practices and policies of research evaluation and gender equality
17.15	**Martin Hendry** The impact of society on science
18.15	*Concluding Discussion Day 1*
18.30	**End of Day 1**
19.45	**Dinner**

- **Tuesday 19 June**

09.00	**Maximilian Fochler** Risky (dis)entanglements: tracing the intertwinements of science and society in living and working in research
10.00	**Clark Miller** Complex societies, complex systems and the future of research organization and life
11.00	**Break**
11.30	**Philippe Galiay** From 'Science in Society' to 'Responsible Research and Innovation'
12.30	**General Discussion and Outlook**
13.30	**End of meeting** and lunch

Workshop Participants

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Introduction

Discussions of novel scientific applications and of the public communication of science are frequently built upon the notion of 'opening science up' to the wider society. Often implicit here is the idea that greater societal understanding and greater scientific transparency will have a reassuring (or trust re-building) effect upon members of the public. Put simply, the notion is that by 'opening up science' its 'impact' on society will be ameliorated or strengthened. Meanwhile, an often-heard story-line – especially among academic scientists – is of science as an institution under external threat. In addition to concerns and criticisms articulated by citizens and so-called public interest groups, new forms of research evaluation (notably, the UK's RAE and now REF), greater career insecurity, the commercialization of universities (for example, *The New Yorker's* characterisation of Stanford as 'Get-Rich University'), the increasing requirement for smaller nations to play the 'international research game', all suggest that it is at least as important to explore how research and researchers are being shaped by societal developments as it is to consider the more typically addressed 'impact' of science on society. The third workshop therefore focuses on scientific practice and on the possibly changing nature of scientific culture under contemporary social conditions.

The relationship between attempts to 'open science up' and at the same time to make science 'strategic, engaged and accountable' can be considered in many ways. In national discussions over research policy there are moves both to make science more excellent (e.g. through targeting applications to the European Research Council) and to present science as a major asset in terms of national economic competitiveness. Whilst attempts to increase the industrial funding of academic research have often been received with alarm by those concerned with the possibly-negative effects of 'commercialisation', new actors such as patients' associations and NGOs have entered the realm of knowledge production, be it to mobilise research funds or to influence research agendas. Meanwhile, exercises in public dialogue and engagement (for example, in the context of many German Federal ministries concerned with technology development or the UK's Global Food Security programme) can be seen both as opening up science but also as implying that research should in some way be 'steered' by ordinary citizens.

In introducing the relationship between contemporary scientific culture and the changing context for scientific work, it must be immediately acknowledged that there are many tendencies and directions at work in this relationship, which can themselves be very different (and possibly even contradictory) in character. Whilst moves towards greater 'engagement' might be occurring at the same time as other steps towards greater commercialisation and output measurement/ assessment, these are very different in intention and scope (even if the hard-pressed scientific worker might simply view them all as 'external constraints' – or yet more obstacles to navigate within a scientific career). Indeed, a good case can be made that research evaluation processes typically direct scientific work away from greater societal relevance and responsibility – and that public concerns over the direction of scientific development are greatly increased by the presentation of universities as 'engines for growth'.

Therefore, and rather than assuming that these very different factors operate in a single dimensional fashion, it is important to recognise that there are many cross-cutting forces within the culture and governance of contemporary science. Indeed, the existence of competing demands must be seen as an important facet of contemporary scientific experience, creating new dilemmas for scientific organisations and for individual scientists. For example, should the head of a research group encourage junior colleagues to get involved in science communication or to focus on journal publications with high scientific impact? How can a 'scientific life' be constructed at a time when the demands upon science are so heterogeneous, multi-factoral and cross-cutting – and when scientific employment includes a growing (though already significant) number of scientists that are subjected to precarious forms of employment and career planning? Are new indicators of success being created in this context or do the 'old' rules of collegiality, standing and esteem still apply?

In more analytical terms, two particular points must be made. First of all, calls to 'defend science' are often built upon the notion of some earlier 'Golden Age' where science was 'pure' of commercial and political influences (cf Shapin, *Never Pure* (2008), also Kleinman (2003)). Claims of

scientific decline need to be viewed as critically as those suggesting that public dialogue is transforming socio-scientific relations. Secondly, discussion of these topics almost inevitably falls into a model which separates 'science' from 'society'. However, Science and Technology Studies (STS) has argued for four decades against this formulation.

Rather than viewing scientific culture and practice as simply responding to (or being under challenge from) external changes, it is important to stress that scientists and their institutions are very much part of this larger nexus – with the consequent emergence of many contradictions, tensions and dilemmas. Whilst scientists are often critical of research evaluation systems which are seen to reduce the assessment of quality to narrow and insensitive measures, these systems are often built upon extensive scientific input (either as members of assessment panels or as committees selecting 'key' publication outputs). Equally, pressures on the scientific career system (eg in terms of tenure or senior appointments) are characteristically generated within scientific institutions (albeit often in response to political and economic pressures) rather than solely 'imposed' from outside. At the same time, whilst many scientists are critical of the use of citation data as a measure of research quality, job applications increasingly make use of such evidence and reference to Google Scholar, Scopus and 'h' factors have become ubiquitous within curriculum vitae and funding requests. There is an important sense therefore that scientific organizations and individual scientists are themselves creating – and one might say anticipating with considerable awareness – conditions of accountability and 'valuing' with potentially-important consequences for scientific practice.

As a final example of the internal as well as external nature of these pressures, whilst criticism of 'managerialism' is widespread in the university system, heads of departments and deans are (with relatively few exceptions) products of the same scientific system (although one is reminded of Marx's premise that people make history but not under conditions of their own choosing). In this circumstance, it may also be that academic complaints about managerialism and bureaucratic box-ticking mask a set of deeper issues about the purposes of scientific work in a time of competing requirements and, especially, an uncertainty about how to balance competing demands. What exactly constitutes 'quality' or 'success' in these shifting conditions?

In this situation, many questions arise:

- What does the apparent diversification of scientific careers, including new forms of precarious and short-term employment, mean for the relationship between science and society? Do changes in the career structure of scientists, including increasing mobility across institutions and countries, make for greater or less 'opening up' of science to larger societal influences?
- In what forms have requirements to engage in outreach activities and to demonstrate the societal impacts of research projects been institutionalised in different national contexts of research funding? How in particular do younger researchers perceive science outreach activities and relate them to their career development and scientific activities?
- How are these issues 'gendered' – in terms of balancing responsibilities, expectations and the willingness to 'engage'? On the one hand, is there a gender pattern in terms of which scientific staff choose to (for example) become involved with issues of science communication and socio-scientific discussion? On the other, does the changing context of scientific research have differential consequences for male and female scientists?
- In what ways have aspirations for or requests to achieve new forms of 'responsible research and innovation' emerged and become a measure for assessing the quality of scientific endeavours as regards both research funding and research performance? How might discussions of 'responsible research and innovation' actually change everyday scientific practices? What might be the relationship between such discussions and the apparently greater competitiveness and 'internationalisation' of science?
- In which institutional domains have the changes in research practice and academic life been reflected – and to what end? Where in the current knowledge production systems might there be space for advancing reflexivity and engagement? What might it mean to create such space – how, for example, could 'science and society' be incorporated within

scientific training? What could be the relationship between such reflexivity and conventional measures of career progression and success?

- How are scientific institutions – for example, universities and research councils – changing their practices in the face of new expectations? What, if anything, is the relationship between the rapid expansion of many universities in order to satisfy societal demand (both at undergraduate and PhD level) and research organisation and practice? And is the expansion of research and higher education accompanied by increased hierarchical 'internal' differentiation?
- Do efforts in the direction of greater public engagement and ethical debate around science represent a threat or an opportunity to the scientific enterprise? What do they mean in the broader picture?

Issues for discussion

Quite clearly, questions of how scientists, scientific practices and the scientific institutions are affected by (and play a part in) the emerging socio-scientific context raise many more questions than can be dealt with in a single workshop – and it would require a substantial research programme to deal with this in a European framework. In this short paper, and as an entry-point to discussion, we will focus on four groups of issues:

Scientific culture: continuity, re-ordering and change

Quite evidently, science has become a major factor in the spatial re-ordering of research and innovation. In this process, university campuses have been transformed from rather enclosed locations in inner-city areas or in outer-city, green-field campuses to hybrid spaces that are considered key for building capacities in high-technology innovation and economic competitiveness – and thus also for industrial and/or urban renewal and urban development. Hereby, university campuses have taken on many different shapes and forms, together with various types of academic-industrial collaboration and initiatives in local and regional (socio)economic integration. Along with the reorganisation of university campuses emerged – in a related but separate process – the increasing significance of research and innovation clusters, and thus of interdisciplinary projects and collaborations. As a consequence, tensions between the problem-oriented interdisciplinary nature of research and the (overall and still) predominantly disciplinary-organised university teaching have emerged or been reinforced.

More generally, scientific institutions can be seen as both driving and being driven by change. Whilst it can be argued – viewed against the background of the whole enterprise of research and innovation – that moves towards public engagement, transparency and ethical awareness remain of marginal significance, it can also be suggested that societal preferences and concerns (for example, around nanotechnology, synthetic biology and human genetics) function as a significant constraint (and also opportunity) – and create a culture where there needs at least to be an awareness of societal expectations and concerns.

There is therefore a requirement to explore how and at what levels, the potential 're-ordering' of science is taking place.

Whilst major scientific institutions often claim to speak on behalf of scientists, it is important to reflect on how changing political and public attentions are having effect at the level of research groups and departments. Part of this discussion will involve a consideration of how scientific research is 'valued' by larger society: as an economic benefit, a productivity measure, a status indicator? As one aspect of this, one recurrent issue for scientists (especially at an early career stage) involves the disciplinary pressure to publish in recognised 'A' journals – a pressure which is often seen as being in competition both with interdisciplinary work and also the requirement for 'relevance'. Certainly, the perception that high academic impact (as measured by preferred research assessment methodologies, journal lists and citation factors) is in tension with 'science and society' requirements must represent a significant brake on scientific re-ordering with regard to the societal embedding of science (and certainly provokes the complaint that department heads and university management are inconsistent in their demands on the individual scientist).

As one illustration of current debates around the 're-ordering of science', we can consider the example of business school-based research. Certainly, management education and research have become the focus of a lively and long-lasting set of debates about the relationship between 'excellence' (as measured by publication in high-prestige journals) and 'relevance' (as in contributing to business practice and offering a sound basis for vocational training) (see Morsing and Rovira, 2011). Starting from the notion in the late 19th to early 20th century that management education should not be research-based but instead designed to offer a very practical foundation for management practice, business schools (especially from the 1950s onwards) were accused of lacking research credibility and academic legitimacy. In very deliberate response, 'scientific rigour' came to the fore with journal publication as a key way of building an academic career. By the late 1970s and early 1980s, concerns were being expressed about this 'scientific' focus and the perceived irrelevance of management research.

This debate continues in often very lively form today – further provoked by business school rankings which draw upon lists of 'approved' journals (such as the UT Dallas list or the FT45) but also by personal anxiety about 'what it takes to get promotion'. Whilst management research can be represented as a special case of a discipline closely related to professional training (although similar points could be expressed with regard to such areas as medicine, veterinary science and architecture), this debate about the purpose of research – and of what it takes to build personal prestige in a scientific field – has wider significance. One can identify in these discussions a fundamental dispute about the role, legitimacy and social status of research (Thomas et al, 2012) – and indeed about the very purpose of the university as an institution.

In terms closer to this workshop's discussion of scientific culture and practice, one can also identify the significance of research publication as a (perhaps the) status indicator within an academic setting. In this situation, and despite the efforts of certain management scholars, 'relevance' can easily be equated with 'worthy mediocrity'. In this situation, and by extension, public engagement activities might generally be seen as an 'add-on' (and perhaps even a boost) to a career but not a prime means of building professional standing.

Lives in science: career, job or vocation?

In his account of *The Scientific Life* (2008), Steven Shapin discusses (among many other points) the historical movement of science from a 'calling' to a 'job'. In the current context, it is highly relevant to consider whether contemporary discussions of 'science and society' either raise or lower the standing of scientists.

Are we increasing the public attention given to science (and hence raising its profile and significance) or instead reducing the status of working scientists by both drawing attention to the 'bads' of scientific development and holding scientists to public account (as when vivisectionists have found themselves under personal attack or those in defence of GM field trials have moved into direct – albeit Twitter-mediated - encounters with anti-GM NGOs)?

Given the diverse occupations and employment patterns of those trained in science, the changing social standing of scientists must also be viewed against the background of shifts in the scientific career structure.

The 'imaginary' of the scientist as the heroic pursuant of truth now sits alongside other constructions: the 'millionaire' scientist who has established a start-up company on the basis of new research, the 'good laboratory practice' scientist performing routine testing to precise technical standards, the 'industry' scientist with a PhD but little job security. To these we must add the 'media' scientist who attracts widespread attention for her/his television performances and associated book sales (usually on astronomy, theoretical physics or topical areas of biological science).

This discussion of the changing status of scientists must also be viewed against the background of a larger discussion about the 'proletarianisation'/ 'precarisation' of scientific work. Thus Sparkes powerfully evokes a 'crisis of faith' among university scientists as they discover that 'the university life they chose was not what they expected or bargained for' (Sparkes, 2007: 521, in discussion of Ronald Pelias). The particular target of Sparkes' account is the 'audit culture' in which careers are assessed strictly according to publication patterns and the development of one's curriculum vitae becomes a key autobiographical

practice, leading to great personal vulnerability when institutions (or colleagues) judge individual worth on the basis of journal impact factors and established indicators of esteem. The depressing picture here is of a university context where academics publish 'pointless research' in order to survive in a hostile and anomic environment. Within such a portrayal of the typical life of a university researcher, it is difficult to see where 'science and society' activities could fit.

Furthermore, with the widespread deregulation of labour markets and employment policies, which has taken place in different ways in many countries since the 1980s, the conditions of employment and career planning have become much more insecure and at times precarious for many of those pursuing a life in academia. These processes were accompanied by increasing demands on the individuals to be mobile and ready to move across institutions and regions. In this context, to be flexible meant to be creative and innovative, as opposed to be immobile and complacent (i.e., inflexible and not innovative). In a related process, scientists have increasingly been requested to be globally mobile and move across national borders to a research and innovation space that seems better equipped, or has earned a higher reputation, than the one 'at home'. In many fields of science, it has thus become a standard requirement to spend a certain amount of time abroad, preferably in the United States. This again has contributed to the spatial and symbolic (re)structuring of science in national and international contexts.

However, the processes mentioned are inherently ambiguous because mobility, even if promoted by employment insecurities and institutionalised pressures, is likely to be accompanied by valuable learning and networking opportunities, helping the individual scientist to become a well versed member of the global scientific community. Nevertheless, a spatially highly fragmented career, a rapid succession of moves across institutions, regions, and countries, pose significant obstacles to serious, certainly longer-term, engagements with 'science in society' issues.

Whilst negative accounts of a life in science need to be taken seriously, they do not of course represent the entire story. However, such accounts do remind us of the sometimes-pressured and certainly competitive environment within which 'science and society' activities will be accommodated alongside more established scientific practices. On the one hand, this can represent a substantial constraint on researchers' energy and commitment. On the other, it is possible to hypothesise that engagement activities can provide a space (if permitted) to step outside institutional pressures and re-connect with the broader aims and purposes of a research career.

Scientists as communicators: anomalies and feedback loops

One frequent debate among scientific institutions committed (at least to some degree) to public engagement and communication is whether it is better to leave this job to the 'professionals' ie those seen to have a talent and training for such things, or to the 'working' scientist (who may have greater scientific legitimacy but little experience in this area). This in turn raises questions of what research communication is for: what exactly is being represented and to whom? As Horst (2013) has expressed this point, is the aim to communicate a field of expertise, the scientific organisation or science itself? Horst further argues that:

'When scientists talk about science in public they are doing more than just disseminating scientific knowledge to non-scientists. They are also representing science and its organizations in a very broad sense' (ibid: 3).

Given the growing density of scientific and technical communications, it is important to investigate the consequences for researchers and for the knowledge and innovations themselves. In concrete terms, this would mean scrutinizing how researchers regard science communication activities, interpret their experiences in this area and relate them to their research and to their (self) understanding. At the same time, it is important to explore how researchers perceive the positive and negative consequences of communication activities. What are the feedback loops from science communication and what do these mean both for individual scientists and for scientific communicators?

One important discussion under this heading concerns whether it is only appropriate for scientists to engage in 'external' activities (such as dealing with the media or giving larger presentations on 'science and society' issues) after they have become 'established' in their career or

whether this is an activity to which more junior researchers can and should contribute. Alongside this discussion of career stage, there is also an active debate about whether science communication issues should be recognised in a more standardised fashion so that credit can be more directly given to such activities within a scientific CV.

An empirical exploration of these and related issues was conducted by Kevin Burchell, Sarah Franklin and Kerry Holden (Burchell et al, 2009). Based on a series of interviews with scientists (especially working in the life sciences) concerning recent developments in the relationship between science and the larger publics, Burchell and colleagues confirm a significant shift among scientists toward an endorsement of, and participation in, public engagement. However, participating scientists also drew a contrast between the generally positive view within the scientific community of the benefits of public engagement and the difficulty of accommodating such activities with the 'already over-stretched job descriptions of most working scientists'.

According to this perspective, 'science and society' activities constitute a 'professional anomaly': 'underincentivised and under-rewarded, potentially detrimental to research, and professionally stigmatising'. Significantly, however, the same scientists expressed considerable ambivalence about the 'professionalisation' of these activities – perhaps in the form of incentives and reward systems. Paradoxically, the lack of official incentives was seen to confer greater autonomy on the individual scientists so that they could participate according to their own strengths and enthusiasms rather than taking part for reasons of 'cynical instrumentalism'. The implication here is that some scientists are motivated to operate in this area and will do so despite (rather than because of) the scientific reward system. In return, the scientists in question get to take their own responsibility for the form of engagement/communication and see this as a space free from institutional intervention.

Responsible research: spaces for reflection?

Given the description of science as an 'overloaded profession' (Burchell et al, 2009), it is extremely important to consider how space for discussion – and practical implementation – concerning 'responsible research' can be both created and defended. Moreover, and as Burchell et al suggest, it is important that the creation of 'space for reflection' does not lead to an 'empty' institutionalisation where, although levels of activity might be seen to increase, the underlying purpose and significance of 'science and society' activities becomes lost and instead a 'box-ticking' mentality comes to dominate.

Certainly, programmes have developed internationally which deal with the ethical, legal and social aspects of scientific and technological developments. To take the UK example, research councils such as BBSRC and EPSRC have developed institutional spaces for critical reflection on research development (e.g. the BBSRC's 'Bioscience for Society' Strategy Panel). However, such research council initiatives serve to raise a fundamental set of questions concerning:

- The relationship between planned engagement activities and the academic 'excellence' of a research proposal (would a high quality proposal be rejected if the engagement element was seen to be below standard?)
- Whether each and every research project should contain an engagement activity (might this not lead to poorly-organised and weakly-considered activities?)
- How to judge in a research council context the 'quality' of science communication and engagement (is this a matter of metrics such as number of people involved – ie 'bums on seats' – or the wider quality of the experience?)
- Whether such moves work best at the level of the individual research project, the research centre/ department or broader programmes and policy initiatives.

In such a situation, it is also important to consider both how to integrate such activities within the scientific career development system (without them being seen as a diversion for the 'less scientifically gifted') and the most appropriate institutional level for this. Viewed more positively, it does seem important to create opportunities for researchers who are engaged in these activities to reflect and learn from each other's experience and to consider common issues and experiences. This might also serve to attract other scientists who

perhaps receive less local encouragement in this direction.

To conclude, and also to provide a few hints on further avenues of exploration, it might be worthwhile to state that issues of science culture (ie the cultures in and of science) are in many ways related to issues of scientific culture in society (concerning the roles that science has taken as an integral part of many domains of modern societies). Science is a rich and diverse ensemble of institutions, practices and norms relating to the generation, validation and usage of truthful and effective knowledge. Thus, cultural aspects of science concern the ways in which scientists pursue certain goals, cooperate and compete, and envision their importance for society. As modern societies have been shaped considerably by science and technology, cultural aspects of science also relate to some characteristic features of these societies, such as the cultural prioritisation of scientific knowledge over other kinds of knowledge, the predominance of science in risk regulation and management, or the penetration of everyday life with scientific knowledge (though its uptake may be quite contradictory).

However, to speak of science culture should also imply that there may be considerable differences both between and within various fields of science, with significant consequences for the cultural 'quality' of a scientific field – in terms of its characteristic features as well as its significance to society (eg as regards approaches to problem solving). Further, even if one describes modern societies as scientific cultures, it is important to note that science is just one institution (or set of institutions) among significantly different yet 'equally important' institutions (or sets of institutions), such as politics, the economy, and law, among others.

In consequence, the boundaries among these institutions are again and again being redrawn, together with the respective roles and activities of scientists, politicians, entrepreneurs, lawyers, or citizens. An arena in which interrelated issues of science culture and scientific culture in society nowadays are playing out concerns the ways in which institutions and practitioners of science relate to problems concerning their own domain (i.e. science, and science in relation to other domains) and society, for example as regards so-called grand or global challenges.

In other words, what we are observing is the continuing renegotiation of the social contract of science, the outcomes of which are not predetermined - nor is the 'ultimate' significance for science, and science in society.

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