Historical Perspectives on Science, Society and the Political

Report to the Science, Economy and Society Directorate
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This report has been written by Dominique Pestre. He is solely responsible for what it says and for the mistakes and approximations it contains. It could not have been written, however, without the constant dialogue he had with Peter Galison, Jean-Paul Gaudillière and Simon Schaffer. It also reflects the many fascinating and rich discussions that took place during the two-day workshop attended by some 40 scholars in Brussels at the end of June 2006.

All my warmest thanks to the Science and Society Directorate, notably to Nicole Dewandre and Jean-Michel Bear, who had the idea for the meeting and made it possible; to Peter, Jean-Paul and Simon for their decisive, vital, regular inputs; to the participants of the workshop for their enthusiasm and contributions during those two great days; and to Tricia Koenig for having done everything humanly possible to render my broken English text into an acceptable, readable document.

Part One

Executive Summary

Executive Summary

1. Origin of the report

On 29-30 June 2006, an open and exploratory workshop entitled *Historical perspective on science and politics* was organised by the Directorate Science and Society of the European Commission's Research DG. The purpose of the workshop was

> 'to tackle the questions of the interrelationships of science and politics through various historical situations in order to enrich today's debates on science and society issues, the final aim being to give input to policy making at EU level about *science and/in society*'

Dominique Pestre, directeur d'études at EHESS, Paris, accepted the invitation of the Science and Society Directorate to scientifically organise the workshop. He did it with Peter Galison, Harvard University, Jean-Paul Gaudillière, INSERM, Paris, and Simon Schaffer, Cambridge University.

The outcome of the workshop was to be a report written by Dominique Pestre. It was to consist of two parts. A set of *direct messages* for the Science and Society Directorate that might enrich their approach to science and society issues. And a *research agenda in history*, a set of research proposals allowing the Science and Society Directorate, if convinced of its interest, to open a research program.

The following report is composed of these two parts and of several annexes. Annex 2 proposes some remarks on the interest and limits of historical studies for policy considerations. Annex 3 offers the analytical proceedings of the workshop and its preparation. Annex 4 reproduces the texts the participants were asked to write to prepare for the meeting. And Annex 5 provides the list of the participants of the workshop.

2. Challenging implicit assumptions, messages from the workshop discussions

The direct messages that form part 2 below aim to reformulate the way we, as historians, tend to represent the science / technology / society / politics relationships and to propose policy caveats derived from these readings. We have tried to analyse the complex matrix that makes the *science and society nexus* and to open up the rather intricate networks of encounters and tensions in which science and policy are embedded. We accomplished this by decomposing that nexus into as many elements as possible (*science and society* as a marker and not a relation between two fixed and independent entities) and by focusing on the master narratives that define science (as an institution of power) and policy (as a set of free actions for the common good). We also did this by proposing different re-articulations of these elements and by systematically complexifying the picture.

We first stress the obvious: that science, whatever its achievements, is human-made; that science has always been linked to powers and interests; that science has limits and is not socially 'neutral'. Science is a way to make words (materially and in the imagination), science performs societies and it transforms their social equilibrium – and is thus at issue between people and groups. Science has never been blindly trusted. Innovation and the direction of progress has always been a matter of dispute and it has always been subsequent to the dispute that safer technologies have emerged. In policy terms, this means that the power of science, of techno-industrial science – or more generally of today's *financial-industrial-academic*

industrial science – or more generally of today's *financial-industrial-academic complex* – has to be compensated by a renewed attention to other forms of knowledge, to alternative values and to social debates. This kind of statement might be considered obvious, but reading EU texts dealing with science leads us to question this. What might be intellectually known, or understood by the science and society directorate, does not seem to be common knowledge beyond these borders.

Concerning innovation, it seems that most policies are still framed in a linear representation where pure science (today called knowledge) leads to economic success. It has been decades since this model has been proven incorrect and it is even less accurate today (if we consider the way companies innovate, for example, or if we take 'knowledge societies' seriously). It encompasses a narrow vision of knowledge that neglects what could be gained, in social terms, by mobilizing what ordinary people know through active learning, exchanges and experience. In fact, with this image, nothing seems to be made to address, in the public space, the question of where innovation leads us and what kind of society and values people recognise as good. Because of international competition and globalisation, it is as if the nature of innovation had not to be discussed, as if 'progress' remained, more than ever, the ultimate solution to all problems.

We thought it necessary to take a detour to reconsider what democratic societies are, what their complex forms of life are – and what 'the political' is. Democratic societies are not unified wholes that can be optimised via science (this is precisely a scientific way of conceiving public action). They are ensembles in cooperation and conflicts that mobilize parallel forms of production and regulation of knowledge to cope with the infinite variety of questions and problems that constantly resurface. For this reason, policies – like the sciences – are not only tentative solutions to problems; they might also be part of the problem.

We also draw attention to the fact that regulations of techno-scientific products and results are numerous in democratic societies (administrative and/or consensual procedures are only particular instances of regulation) and that they follow different logic. The logic may be that of the national expert body that defines safety regulations but that is tempted to optimise economic growth; or that of the court that deals with damage and redefines precaution through jurisprudence; or alternatively, that of patients and activists, markets and advertisers, who weigh on regulations of knowledge and products. We draw attention to the inescapable tensions between individual and collective logic; between decisions based on sound knowledge and democratic disruption of norms; between elective logic and that of the media space, etc.

Concerning the changes that have occurred over the last few decades, we thought it important to stress the (partial) dissolution of the century-old alliance between state, industry and science in the frame of the Nation, because that alliance had given science a specific legitimating function and a key political role that it can no longer hold. We draw attention to changes in dominant knowledge (bio-business versus high energy pure physics, for example) and the consequences in terms of social reappropriation and usage. We stress the need to better understand the new social forms of contestation and activism that have emerged – an essential parameter in policy terms – but also the way universities now tend to be governed (a worrying situation) as well as the way the political (and notably the boundaries between public and private, individual and collective) has been redefined through this multi-layer process.

The fact that science is not a unified system and that it is made of quite different species (clinical medicine *vs.* experimental biology *vs.* epidemiology for example) leads us to recommend particular attention when policy makers have to consider the implications of a new technology or product. Organising the confrontation between these species in a fair way

technology or product. Organising the confrontation between these species in a fair way (a way that counteract the systemic asymmetries of power) is central.

All policy should also take into account the mass of knowledge that is produced outside academic-industrial sites. The confrontation will not always be easy to organise, however. Policy makers should not imagine that they can do it globally (modest government might be a virtue here) but they should specify the rules, anticipate asymmetrical relations and monitor social behaviours. They might help make visible and protect this huge world of amateur knowledge and sites of production. They should also be ready to act after the events when more is known, and they should be ready to abandon the illusion, which they might share with scientists, that they could know everything in advance.

We suggest that patent and intellectual property rights should be put back on the list of questions. There is an outstanding issue because there is no 'natural' move in this field (choices are politically informed), the precise definition of IPR and patents has always been a weapon in economic battles between countries and regions (and it could be one for Europe), but more importantly it might be a hindrance for the development of 'knowledge societies'. If 'knowledge society' is not to become a mere slogan for endless innovation without discussion and if it is to become an ideal for democratic societies mobilising all knowledge producers, then precisely regulating the coexistence of diverse forms of values is essential.

3. Main lines of a research program in history

The research program that is proposed in part three below is mainly conceived for historians, notably historians of science, technology and medicine, but is not limited to them. The program should include strictly built comparisons between various moments and situations in the past and the present, confrontations of case studies, but also a deliberate theoretical framing of questions to be of relevance for today policy problems. The aim of the program is to explore the conjunctions and tensions between the logics of knowledge and that of democratic societies, between techno-scientific dynamics and market order, between that order and the many regulatory frames that were successively invented to cope with damages and complaints, between the 'official' world of economic, political and administrative actors and associations, amateurs, activists, patients, consumers and 'civil society'.

The aim of the program, or more precisely a decisive by-product, should be to increase the reflexivity of historians, social scientists and policy actors, to enhance institutional and social memories and to help invent other forms of grand narratives than the most common ones, that is narratives that would help people gain back a sense of what happened and what is going on.

More precisely:

The program should ask for projects prepared to consider regimes of science and knowledge in/and society over the last three centuries, to analyse how competing forms (or kinds) of knowledge developed and to document the intense exchanges that have always existed between these various ways of doing, arguing and developing artefacts.

It should ask for projects to study how knowledge was controlled and appropriated in these diverse regimes of science in/and society, what happened to knowledge through that process, and which technologies were used to open or restrict access to it – or actively build ignorance (as the tobacco industry seems to have done).

The program should propose to study the many kinds of bodies, institutions and norms that were contradictorily invented to regulate scientific and techno-industrial products, the relations that these diverse institutions and systems of norms had one with the other, the 'natural slope' in the way each tended to legislate -- – and the overall effects on innovation and economic development, social change and precaution.

The program should actively ask for the mapping of (the variety and importance of) amateur ways of making knowledge, the forms of non-professional agency that were invented, the various figures adopted by these amateurs, the differences 'in kind', if any, between this knowledge and official science – in addition to questioning if something new has been happening recently.

Governance, governmentality and active management of knowledge, as well as through knowledge, should constitute another major aspect of the program. Common notions today, like accountability, responsibility or audit, should be approached in an indirect way through historical situations.

Finally, what we called the various parallel or successive discursive orders that defined the various regimes of science in/and society should be carefully considered. Genealogical approaches (a way to make today contingencies thinkable, as Nikolas Rose says) are necessary in order for that to work but other technologies could also be of use. This part of the program is essential in reflexive terms for historians and social scientists, but also for policy makers

In terms of 'products to be delivered', the workshop recommends valorising outreach programs, and from the onset, having them included in all projects. It also recommends diversifying the kind of products the program asks for (books and articles but also films and exhibitions) and the active building of new set of experimental archives.

4. A last word on the writing of the report

In order to ease understanding, referencing and discussion, the report is presented in successive numbered paragraphs. To avoid having an overly lengthy report, these paragraphs have been written in a fairly condensed format. Details could be found in participants texts in Annex 4 (that often include bibliographies).

The order is from the more general and obvious statements to the more specific ones. The more general statements are recalled, even if not discussed as such during the workshop. Most of the paragraphs have policy considerations in mind and most are written so as to be of some help to policy makers.

Thanks to the numbered system of presentation, a second executive summary is proposed in Annex 1. This more *analytical summary* could be used as a reference tool since each statement in this analytical summary directly refers to a paragraph in the report.

Part Two

Challenging implicit assumptions
Messages from the workshop discussions

Challenging implicit assumptions

1. About ‘science’ in its relationships to society

1.1. *Science is made by human beings living in society.* As such, science encompasses human shortcomings, blind spots and disputable simplifications; science does not speak in one voice – experts and scientists disagree on many points; science is not absolute, ‘objective’, pure truth – even if science presents interesting and useful results. This statement is not meant to be despising or ‘relativist’, but to articulate the social and human nature of any knowledge production process. This is a central statement in policy terms because it asks for precaution in the consequences one might draw from science results.

1.2. *Science is not only, or principally, driven by its own internal logic*. The deployment of the various sciences and the paths they follow are determined by multiple factors. The questions they tackle, what they study and what they forget, the way they pose and approach their problems are all dependent on numerous element. They vary according to epistemological choices (not all disciplines work according to the same principles), to institutional frameworks, social modes of control, the nature of sponsors, etc. The (partial) dependence on context explains why devising *research policies* is not a meaningless project -- as well as why they might work and produce results.

1.3. Another trivial fact is that *modern science is not only ‘knowledge’ but also practical activity*. Through controlled experiments, precise observations, classifications, and the use of mathematics and numerical relations, modern science is operationality, it is a way of doing which allows for a *mastery* of phenomena, of nature and things, of human beings and society. It is also a means of tackling questions which permits a more ‘efficient’ acting in the world. For most people the fate of science is linked to, has to do with, and must share the social fate of the artefacts and (immaterial) technologies it helped to develop. This kind of social attitude is quite understandable – and policy makers should acknowledge it as being fair.

1.4. Because of this operational way of establishing facts, *modern science has always been linked to powers of all kinds*. It has been used and mobilized by social institutions, and science has offered its services to such institutions as courts, democratic states or commercial companies. Science has been a way to do things but also a way to rule – via scientific management, operational research and social engineering. Historically, it has been a way to help those in power – business people, military people or politicians – to better understand, and subsequently better manage, nature and societies. This fact has been at the core of many criticisms of techno-science – including criticisms coming from scientists themselves – and still underpins critical attitudes today.

1.5. These first ideas are not new but they merit emphasis in guise of an introduction. They show that framing the question in terms of the relationships between two entities – with science on one side, society on the other – is an overly simplified and misleading way of posing the question. Science is not a ‘thing’, a clearly defined ‘object’, or something with only one definition. Society is not one block, one whole, or a fixed entity. Therefore the question is not that of the relationship between two ‘entities’ that could be ‘optimised’. The expression ‘science in/and society’ is an indicator of a decisive question in social and political terms, however, any policy maker must be prepared to drastically vary their frames and basic

ever, any policy maker must be prepared to drastically vary their frames and basic categories if they want to take the complexity of the world into account.

2. About the relationship of modern science to technologies and progress

2.1. *Science is not a simple and neutral vehicle for progress and a better world*. Science carries predefined categories and values are present in its language, tools and structure. As any human production what science produces must be part of the world and be linked to social preoccupations. Modern science has never been universally considered as a good in itself --because it is not above or apart from society but within it, and because it is intrinsically linked to technologies. Science can provide interesting and useful solutions to problems faced by individual people and social groups, however, it should also be viewed as proposing solutions that are partial and partisan, *solutions that are also part of the problem*. Therefore, it is a duty, on the scientific side, to be cautious with the social implications that are *de facto* embedded in science and techno-scientific products, and legitimate, for anybody else, to question them.

2.2. *Science* – scientists in action, as well as scientific institutions – are *not always attentive to the consequences of what might come out of the Pandora's box they are constantly (re-)opening*. Scientific (and techno-scientific) institutions produce results and technologies that are made available through open literature and markets, that *de facto* transform and reconform societies, but without considering what the social or moral implications might be. Science often involves more action than reflection – at least in its techno-scientific forms. In other words, science, as knowledge linked to techno-systems, *de facto has a politics* since it favours certain ways of being and renders other futures more difficult, but without being often aware of it. Modern science, as a system of knowledge, norms and technologies, is a powerful way of performing the world and redefining it. Consequently, it is normal for members of the social body to react and question, even in radical ways, what (industrial-)(techno-)science has to offer and how it affects them as human beings and as social groups.

3. Concerning innovation and science policy

3.1. *A common tendency is to maintain some kind of linear model of innovation*. Future economic development is supposed to start with science and research, then to move to development and technology, then to innovative products and finally to economic success. This 'linear representation', which informs today's (quasi) universal stress in policy circles on 'the need to invest in knowledge', is false. *It is false in macro-economic terms* and *in the way companies now conceive their innovative products*. This does not mean that scientific research is not important but that other elements may be decisive for economic success.

In policy terms, this means that it might be beneficial to consider science and knowledge as more than pre-technologies. It might also mean not being too narrow in the programs that are financed, for example by not sidelining entire fields of research under the pretext that they do not seem (immediately) useful or applicable. Historians have showed that the path followed by innovation is often improbable and that elements that are unimportant (in market terms for example) may not be meaningless in other terms. Historians have also shown that what seems 'inapplicable' or useless today might be economically decisive tomorrow.

3.2. *Another tendency is to consider that the opinion of non-scientists*, even if not negligible, *cannot have the same weight* as that of scientists, engineers and company managers *when science-in-society questions are posed.* It is now generally agreed that 'lay people' should be

ence-in-society questions are posed. It is now generally agreed that 'lay people' should be listened to (as they protest, as they vote and as they choose the products they buy) but their opinion (often) continues to be considered of negligible value for understanding science in society. Our feeling is that, in terms of policy, it is just as important *to also start with the reverse statement* – namely that scientists and engineers too often do not realize, or acknowledge, that their knowledge is very imperfect and limited, and *that there are many things they do not know*. Scientists generally agree on this abstractly. That is, they know that scientific knowledge is in perpetual refutation and is provisional. But they are (we all are!) reluctant to acknowledge this for the knowledge *they (we) now propose*. Scientific intellectuals may not realize that other forms of knowing exist – forms that are also interesting and productive – and that it would be wrong (morally as in terms of global social efficiency) not to respect, protect and even promote these other forms of knowing.

3.3. Recently, there has been *a tendency to think the world is becoming anti-scientific and irrational* and today's problem is that 'trust and interest in science have disappeared'. This description is probably too simple and unilateral, and thus may not constitute a good starting point for any policy. A first general remark should be made: namely that, in *historical terms, (techno)-science seems to have never been spontaneously trusted*, and that science is probably more valued today than in the past. The present day question probably has less to do with an intrinsic lack of *trust in science* than with a lack of trust in the *regulations* of techno-science and techno-scientific products (consequent of mad-cow disease, of problems with asbestos, etc.). Or with changes in social realities and values (more educated people might ask for more control on what is offered to them, students might prefer to go to business schools that to scientific universities because financial income is becoming a key social value). Or with the transformation of techno-industrial regimes of production and some of their social consequences (in terms of risks for example).

3.4. More generally – and historians can sustain the claim with hundreds of examples – *criticisms, refusals and oppositions* to sciences, to technologies and to their direct and indirect effects have not only been massive in the past, but they *have always been essential for the development of safer technological systems*. Criticisms and subsequent actions by users, by consumers, by neighbours, by victims, by citizens, by activists, by local groups and associations have been constant and decisive on the long run. Whatever historical example we consider – new technologies and safety, chemicals or pesticides – the shaping of our technological systems, or more precisely the making of a safer techno-industrial world, has been largely achieved due to contestations and the solutions that had to be invented to cope with them. Today – this is a matter of principle to be considered specifically for each situation – these people and contestations should (probably) be carefully listened to.

4. About the science / society relationship as seen from the way democratic societies function

4.1. In democratic societies, *an essential tension exists between 'deciding on the basis of scientific knowledge and excellence' and 'deciding democratically'*. Scientific knowledge (and probably most kinds of knowledge) tends to be hierarchical and exclusive since they are based on the command of 'better information' and of a 'better understanding of reality' (only 'informed people' can take the right and proper decision). Democratic decision tends, in principle, to be more egalitarian, more inclusive of all voices and less dependent on hierarchies of authority. That tension cannot be bypassed easily; and no general solution, procedural or otherwise, can avoid it completely. On the contrary, it might wiser to acknowledge and face the situation, that is, to accept that there is no other option than *to pragmatically navigate between both poles* and thereby deal with the unavoidable tensions.

There are a number of reasons for which the opposition is particularly vivid. They include: institutions making this abstract cleavage a constantly renewed and solid reality; the sheer (material, financial, intellectual) interests playing their role; scientific knowledge being crucial in managerial terms – even when experts disagree. But democracy cannot be ignored, particularly when oppositions are strong.

4.2. *Modern, democratic societies* are complex in another sense: they *are an ensemble that call for, and cherish, a multiplicity of independent and parallel regulations* (for reasons of principles, since Montesquieu, but also for functional and practical reasons). The ways of 'regulating' techno-science and techno-scientific products, the mechanisms through which the social body tries to cope with and master them, are thus truly numerous. They include standard procedures (before introducing a new drug for example), expert committees, political campaigning and lobbying, different forms of debates, post-hoc sanctions (by consumers or voters). They also include regular elections, governments and parliaments (and their offices of scientific and technological assessment, for example), international organisations (like the World Health Organization), administration and other agencies, technical bodies implementing decisions or controlling the production and circulation of products (chemicals for example), jurisprudence and courts, laboratories and metrological centres, NGOs and whistle blowers -- as well as managerial norms and markets (decisive in the spread of new technologies), material standards and technical devices (implementing property rights on DVDs for example) and of course public demonstrations and activist denunciations, consensus conferences, citizens juries and other forms of participatory politics.

4.3. From a historical angle, *tensions are not mainly situated with 'science' on the one side and 'lay and ignorant people' on the other*; and not mainly between 'top-down, State-like (autistic) management' and 'civil society (openness)' -- which are the lenses through which they are often described today. Most commonly, they are embedded in disputes concerning the *institution that is the most adapted and legitimate to resolve the problem at hand*. These disputes have mainly opposed (1) political / state modes of regulating -- through legislative action, bodies of inspectors or permit markets, (2) administrative / expert bodies advancing norms and standards, (3) legal systems and regulation by court decisions -- when 'victims' complain, and (4) markets and economic ways of making products available -- invoking the freedom of the consumer or the necessity for a country to survive international competition. And they have been resolved through (productive) tensions between these official and legal modes of finding solutions and various forms of activism and contestation – by neighbours (the NIMBY argument has always been present), by associations acting locally or for global reasons (defending Nature for example), or by appeals in various forms of direct democracy.

4.4. In short, techno-scientific knowledge and products are regulated by various institutions – but *institutions that work according to different principles*. A court serves to listen (and to be attentive) to a particular victim of damage that has already occurred. This is not the case for an expert group preparing general safety norms for the future. Their way of regulating will thus be specific, favouring certain principles over others, and it will be obviously mobilized differentially by people. Thus in policy terms, it might be important when proposing action to keep this large panorama in mind and to consider its potentialities and complementarities.

4.5. It might be that no readymade, universally valid solution can be devised for another (more pragmatically informed) reason: *power relationships are part of the world*, they are essential parts of any social, political and economic life. The vision of democratic decisions that lobbyists and most liberal thinkers convey is a massive reality in our market-based societies. This vision is less that of Habermas, of the rational, communicative building of a consensus between people of good will, than that of a mere bargaining activity between rival

sus between people of good will, than that of a mere bargaining activity between rival groups, of a trading game in which interests are explicitly defended to get at a workable compromise. This vision of the world is important and should be kept in mind when considering how policy can be devised around science in/and society if *true fairness* on the one hand, *efficiency* on the other, are to remain central criteria.

4.6. We stated that modern science is practical performativity and not only abstract and 'pure' knowledge, that it produces artefacts and norms on the spot (in industrial laboratories, in metrological centres, in insurance companies) and in conjunction with other specific actors (military, industrial and political actors for example). We also concluded that science has the power to constantly redefine people choices and futures, that it has a *de facto* politics. Most of the time, however, science has a politics *but without the need or the usefulness for democratic mediation*. Scientific and technological actors mainly *act* (via publications, via expert advice, via the conception, making and selling of products). They just *do things* in connection with engineers, companies, governments, thus reconfigure and perform the world. Democratically debating what is happening or what might happen because of these novelties is rarely considered beforehand by scientists and engineers – and perhaps cannot seriously be (rational anticipation may have drastic limits). In fact, that demand is most often voiced *afterwards*, after the events, when consequences start to appear and/or *from outside*, from un-happy outsiders who try to reverse a situation that has unfavourably affected them.

4.7. To make various logics more accountable, *the policy followed by the EU over the last decade was to foster wide ranging participation in the decision processes.* This policy was to consult and – at least in theory – to make a decision following large debates mobilizing as many 'stake-holders' as possible. This was intended to help 'interested parties' to organise themselves and become experts, as well as to confront experts and 'lay persons' in set-ups defined as precisely as possible. This policy frame is of utmost importance and constitutes a most positive move (in particular because most national states were then closed to this option). During the workshop, the common opinion was that such a policy should be pursued and that it should be defended *because it sets rich and interesting standards and norms* (of general accountability, responsibility, good procedure, etc.).

But because democratic societies functions according to multiple parallel and independent logics, because *technological progress* is an imperative at the core of national and social development (the push being to always accept most if not any innovation), and because it might well be that no solution is optimal *for all actors at the same time*, it is likely that such policy *will bear fruit only on the margins* (which does not mean that it is unimportant). This rather pessimistic remark does not mean that this solution should not be advocated for (we explicitly voice the contrary) but that it is likely that, as in the past, the trajectory of technological development be shaped largely afterwards, in reaction, through happy acceptance, strong resistance and bitter conflicts, and through the mobilisation of all the modes of regulation available in democratic societies.

4.8. As a summary of these seven remarks, we might say that it is very unlikely that there is a universal solution, a generally applicable procedure that would permit to by-pass these numerous tensions that also form democratic societies. As Ricoeur wrote : '(…) une démocratie n'est pas un régime politique sans conflits, mais un régime dans lequel les conflits sont ouverts et en outre négociables (…) Sous ce régime, le conflit n'est pas un accident ni un malheur ; il est l'expression du caractère non décidable de façon scientifique ou dogmatique du bien public (…) La discussion politique est sans conclusion, bien qu'elle ne soit pas sans décision'.

5. About the changes that seem to have occurred over the last decades

5.1. Apparently, the equilibrium between the various modes of regulating science and techno-scientific products has been modified over the last decades in fairly significant ways; initially in the United States and more recently in Europe and the rest of the world. A first aspect is, in simplistic and short terms, that markets, international finance, courts and 'governance' seem to play a greater role than before and that national administrative bodies and elected representatives play a lesser role (differences remain enormous, however, between, say, the United States, where the defence of the Nation's interests is just as important as before and, say, Mali, where the partial destruction of the state apparatus led to a clear weakening of political authorities).

For (academic and industrial) science, key elements of change have occurred in intellectual property rights and patenting and in the fact that there are many new, powerful players in the science business alongside universities and the military-industrial complex (I mean venture capital, Nasdaq, pension funds, lawyers, etc.). *The cursor separating science as 'open knowledge' from science as 'private good' has moved towards a reinforcement of the latter.*

5.2. *For universities*, this might mean *a change in their finality and perhaps in their core values and in the normative definition of what 'knowledge' is.* It might mean a change in their way of working (with a new role for professional managers, in Britain for example), in the topics they study and the ones they neglect, in the definition of their autonomy and the conditions of their collaboration with companies. These changes do not seem to be insignificant and any policy for science in/and society should consider them carefully. In particular, it might be wise to be careful with the 'positive value' that we 'spontaneously' attach to notions like 'trans-disciplinarity' (versus disciplinarity), 'mobility' (versus tenure for example), 'networking' (versus stable unit of work). A policy warning might be that these words should not be perceived as positive signs in themselves, or considered as indicators of an obvious 'progress'. They might be – but they might *not be*.

5.3. It also seems that societies (if such a broad term may be used) *have undergone parallel (and perhaps as drastic) changes*. 'Societies' have become 'flatter' in a way. Recent decades can perhaps be said to have seen the end of class societies -- although they have become far more polarized between rich and poor, or between part of the South and the North -- as new ways of defining social and personal 'identities' have developed. Modes of political action have been transformed, from the trade unions' long-term model (which still dominated in the 1950s, 60s and 70s in Europe) to the variety of NGOs and militant groups that are centred on specific question, short-term principles of efficiency and networking. Modes of political action have been transformed from nationally defined frameworks to world activism and from claims for social justice (directed to state-like structures) to a complex mix of direct and media-oriented kind of action, of participation in official bodies and boycott. The European Union has taken note of many of these changes and has adapted its policy accordingly. The question might be posed, however, if we have not gone too far and forgotten, for example, some of the voiceless 'stakeholders', the lower 'socio-economic groups,' and their manner, and difficulty, of expressing themselves in this framework.

5.4. *The 'dominant' sciences, the techno-scientific activities that put their mark on societies* (in material terms but also, and more importantly, in symbolic terms) *also seem to have been profoundly displaced*. Sciences and technologies of information and communication, the whole of bio-business (bio-genetics, bio-technologies, bio-medicine), the question of environment and 'sustainability' – but also the whole world of management, accountants, audit and economic sciences – have replaced, at the top of tabloids, social imaginaries (and

and economic sciences – have replaced, at the top of tabloids, social imaginaries (and scales of salaries in many universities), physical sciences (and high energy physics in particular) and most traditional social sciences. The new shiny sciences and technologies have also contributed to the displacement of the question of 'humanness'. Bio-, nano-, techno-sciences offer the possibility of redefining, by re-engineering, one's own body, and lead to the questioning of traditional norms and values -- such as those raised by the question of cloning or of the place to be given to wastes of all kinds.

5.5. The changes of the last decades also meant the (partial) *dissolution of the strong and lasting alliance built in XIXth century between politicians, administration, scientists and economic elites*. Built under the shared umbrella of the nation states, with representative governments, national industry and armed forces, science had been granted a special position. That is, a position that was quite apart, 'above interests and conflicts', thereby giving it a decisive legitimating role. Science was not really at stake between social actors. After the certainties and strong dichotomies of the Cold War faltered, however, certainties have become fuzzier. Science as superior and independent knowledge was no longer in absolute need and science as institution appeared as mobilized by social actors for their purposes and interests. The fact that science appeared, in 1900 or 1950, as above the fray, as unique, as a coherent, rationally-constructed whole – in fact as the core of 'western' rationality – partly evaporated when the power relationships that grounded this make-up disbanded, and when it became visible itself. In short, it is perhaps not that scientific knowledge is now less 'trusted', as we have said, but that its function as a legitimating authority is not as central anymore.

5.6. In this new 'context', *science and techno-scientific successes produce two opposite kinds of reaction*. On the one hand they lead to *precautionary attitudes* (certain people might prefer to call them technophobic attitudes). This mainly occurs when techno-scientific novelties are perceived as threatening collective goods, such as public health, the environment, or existing cultures; or when they look too greedy and ready to put the world at risk for money; or when they contradict well-entrenched ethical and religious principles; or when they seem to lead to too difficult to anticipate futures. Then, on the other hand, science successes lead to another, symmetrical attitude: *a nearly absolute confidence in progress*, a technophilic kind of attitude. This attitude appears when one's own body or one's own health is at stake, when techno-sciences promise definite cures (for cancer or for paediatric illnesses, for example), or when technologies appear as possible extensions of one's own pleasure and mastery (people who welcome the prospects of becoming trans-human or cyborgs, for example). Then everything is easily tried and requested – even when official science does not consider the solution sufficiently safe and tested (a situation introduced with AIDS). To grasp this multi-faceted tension that is presently central in the public relationship with science via technologies and medicine, and which explains why the notion of 'new distrust in science' is inappropriate, it is enough to contrast attitudes vis-à-vis (individual) gene therapy and vis-à-vis GMOs. In this context, it is not surprising that policy consequences cannot but be rather complex.

5.7. As a consequence of these six inter-related changes, *a new definition of the political seems to have emerged*. First, there has been a double 'privatisation' in the political sphere, with two opposite meanings: (some) questions formerly defined as private have become public (gender politics for example), and (some) questions formerly taken charge of by public authorities have now become private business (social security in some countries for example). Second, contrary to the central place occupied by (what has been called since the XIXth century) 'the social question' (which structured political agendas for nearly two centuries in 'right' and 'left'), there has been a multiplication, a non-hierarchy, an open set of questions and arenas defining what constitutes politically legitimate questions. The last aspect, in a nutshell, is that governance, notably through calls for (a generalized) responsibility (at world

level) on the one hand and a global (but perhaps not well-defined) accountability on the other, has replaced the strict, legal constrain of national frames (for example the definition of the 'citizen' as a bearer of rights and duties in a precisely defined territory) as the proper categories through which to pose questions in the public sphere.

6. About knowledge and the variety of its sites of production

6.1. *Science is not a unique formation, or a unique and unified world*. The sciences are based on different epistemic attitudes. They proceed according to divergent methods and ways of constructing proofs and of establishing truths. They are made of various disciplines and built according to different technological and calculatory standards. When several formations contribute to the understanding of a particular problem – 'is that new technology a safe technology?' for example – its is essential to carefully organize the confrontation between them, and not, as is customary, to let those who invent new products and have them distributed (engineers in companies for example) dominate those who analyse, test or control complex parameters (toxicologists, ecologists, clinicians and other epidemiologists) and who need more time and money. To fail to make that an explicit rule in policy terms, and to fail to enforce it, might be a policy with potentially major negative consequences -- possibly in terms of health or dangers to the eco-sphere, but also in political terms, in terms of the trust people put in democratic institutions.

6.2. As a whole, however, the different science formations are part of a global, particular way of producing knowledge, they share something we loosely identify as Science. But this *Science* is only *one mode of knowing among other modes* -- even if it is a particularly powerful one in terms of innovation and technology or in terms of its capacity to produce new worlds. The other forms often have less legitimacy in our technological societies that are in stark economic competition. They might be more local, they might concern small population (indigenous knowledge of the local flora) or very large ones (women trying to understand their fight against breast cancer). They might implicate people with very specific kinds of preoccupations (parents of children with a particular illness), people trying to impose what they consider a decisive common good (measuring and controlling radioactivity) or united by an ideal (open source software). They might work through the web and build databases, they might be more biographically oriented or be fans of a particular technology. They might militate for the diffusions of a promise, act to change legislations (on IPR or trade restrictions) or look at questions from a holist point of view. Their knowledge is labelled – depending on whom is talking about them and the way they value them – as non professional (very despising) /amateur /popular /practical /alternative /subaltern /indigenous /non-reductionist, etc.

6.3. A remark is apposite here: *there are presently strong claims that this kind of 'amateur' way of making knowledge, this bottom-up, or user-driven, way of working is gaining ground*. It is often presented as contesting the hegemony of official techno-science and as becoming itself professional. In other words, that a 'pro-am movement' is taking shape, that it might displace the existing order of knowledge and become our new collective future. There is little doubt of a trend of reappropriation of knowledge by many actors, or of a diversification of sites of knowledge production. And there is little doubt of its importance for precaution or building 'knowledge societies'. More work is needed before one can be sure that it is opening up a *qualitatively different world*, however, or that it will displace techno-scientific hegemony. Amateur radio-fans in early 20th century, for example, could be described, without exaggeration or anachronism, as a large community of 'pro-ams' sharing a culture, having their autonomy, becoming a resource for industry -- but they did not displace the big firms. As historians, we might also be tempted to recommend *to not romanticise* these

torians, we might also be tempted to recommend *to not romanticise* these fascinating and productive popular moves.

Again, the point is *not to deny the necessity to actively include them in any policy* aiming at developing and making use of all forms of social knowledge. More modestly, it is to be aware of the extreme variety of situations (the *Association Française des Myopathies* and what we call 'popular epidemiology' have rather different relations to official, laboratory-based science) and of the variety of the links established between these 'amateurs' and professionals, between them, academics, engineers, product development and companies. Today, for example, 'users' are actively mobilized and tested in focus groups by company's engineers and social scientists to help innovation anticipate its 'audiences'. In fact, we should learn to properly *describe* these people, sites, tools and aims in their multiplicity.

6.*4. The nature of the knowledge thus produced was also considered at length* during the workshop. This is an essential question if we want to imagine the kind of interactions that can be favoured, in terms of policy, between 'amateurs' and official science. Again, it is the variety of knowledge that struck us most when confronting the many cases that were at hand. Some knowledge directly faces the blind spots of laboratory, reductionist knowledge by entering areas where science is badly equipped (knowledge of the body and its maintenance in order to anticipate back pain, for example) or by deploying / promoting a more 'existential' kind of knowledge (making a collective trying to express a way of living an illness or a treatment). Symmetrically, there exist forms of 'alternative' knowledge that directly contest official techno-science on its own terrain (expertise of many groups on nuclear wastes), or propose other policy frames (they claim that they know about aspects that science does not see; or that there exist more efficient ways of regulating knowledge production without overly narrow property rights for example; or that modern selection of seeds in agro-business is at the root of chemical pollution). Other kinds of knowledge, finally, correct science on its own principles by denouncing bad practices and bad science -- something feminists have done with a rare efficacy in many questions ranging from biology to sociology.

Finally, this immense *territory of non-professional (techno-)science is of utmost importance to policy terms* because there lays a large set of untapped resources that should lead, if properly considered, to profound re-readings of what is too quickly called 'knowledge society'. If that phrase is to be taken seriously, in a heuristic and productive way, then policy would start by trying to map such a vast world. It would start with a description of the complementarities with the more classical approach of science and should probably lead to clearer *policies of protection* of that universe -- for its own sake but also for the sake of us all (it might be quite efficient in economic terms, for example).

7. About the question of appropriation of knowledge

7.1. *The question of IPR and patents has become a lively political question in Europe* because of major changes in recent years, and because some people still push for an even greater move towards extended IPR, notably in biotechnologies, software and management methods (there were countries and sectors, pharmacy in France for example, where half a century ago, it was still rare to patent). IPR and patents are central elements of liberal economies, however, and scientifically driven innovation as a private good is not a recent phenomenon. On that point, historians can provide long-term visions of these phenomena and detail the tensions, forces and choices that modelled successive regimes of IPR – the one in place up to the 1970s, for example, as the new one.

7.2. The way IPR and patents are defined is a central tool in international competition (as they have historically been in the economic / political battles between countries, and as they remain to be). It seems wise, in policy terms, to consider *what the effects of various forms of IPR and patents could be, notably for Europe in its competition with other regions and countries*. More precisely, the level at which one can take patents (upstream of university research for example or, on the contrary, downstream of development) remains a question to be precisely considered since it has major consequences on what will be considered 'knowledge', on the way universities will work, on the distribution of wealth -- but also on the dynamism of the innovative process.

7.3. In term of policy, *the question of IPR should not thus be treated as a non-choice* – as a fatality, as something given, as something beyond control and discussion. It should not be treated either *as a mere technical question* (it would just be the way patent officers do their 'business') but rather as *a range of possible options in a palette of policy tools*. Deciding where to put the cursor separating open knowledge from proprietary knowledge is a key political signal for 'knowledge societies.' It is also a strategic lever that Europe could use in economic competition.

7.4. If we believe that we live in a 'knowledge society' (a society in which knowledge and its mastery by as much people as possible is the ideal), forms of producing, certifying and appropriating knowledge are central questions. The point is not to attack the legitimacy of proprietary knowledge but to recognise the importance of other forms of life, the social legitimacy and economic importance of other ways of making knowledge (open websites gathering information on rare illnesses, for example). In policy terms, *their role, their interest, their importance need to be evaluated and they should probably be protected since they correspond to different values and different systems of norms*. Democratic societies have much to gain from accepting and learning how to live with variety since variety is an asset in efficient 'knowledge societies.' Societies able to have all social forces mobilized and ready to invest in all levels of knowledge production and appropriation, ask for it.

8. About participatory politics and governance

8.1. *'Participatory politics', 'dialogic and technical democracy' are useful and powerful expressions in normative terms*. Participatory politics defines an interesting model for democratic action, a model complementing the more traditional form of representative government (even if it is not historically new and even if it could take many parallel forms). It is a model that should be implemented as often as possible, notably because of its educational virtues. In terms of principles, it encompasses an attractive and positive ideal.

8.2. *However, conceiving 'a good decision' in contemporary market-based democracy mainly as the end point of cycle of debates* that can be conducted in a fair (and rational) way and *that can lead to a more acceptable and robust consensual solution* is a claim that is too simple. In other words conceiving decision *as relying first and foremost on a form of well-organized exchange of arguments* is a claim that is probably un-realistic, not to say misleading. Nothing indicates that an optimal technical choice should emerge when proceeding in this way (the question of the dikes surrounding New Orleans was discussed during the workshop) or that it would lead to less conflictual situations in the social body.

8.3. *Believing*, or allowing to believe, *that this kind of social practice could or should become the major mode of regulating techno-science and techno-industrial products in society is misleading too*. This is because nothing seems to prove that *Real*-democracy (if I may create this analogy with *Realpolitik*) is better off when under one unique (even if normatively ideal)

analogy with *Realpolitik*) is better off when under one unique (even if normatively ideal) form and because of the importance (already described) of parallel forms of democratic regulation (who could contest the right of going to court to have a decision reversed? who would deny the right to politically reverse a choice through an election?). But also because nothing proves that the core of democratic life mainly resides in devising the best/optimal *procedure* to collectively *decide* on each topic -- and not, for example, in *protecting alternative ways of making worlds* (protecting open software movement from private companies trying to eliminate it), *in helping dissidents* to go on with their expertise and publicize it, *in favouring post-hoc assessments and control* (such as in giving more importance to what Rosanvallon recently called *la démocratie de surveillance)*. More ambitiously, one might try to imagine the kind of general 'constitution' that would be needed to be adapted to our market-based, democratic, contemporary, 'knowledge societies.'

8.4. *The parallel idea that civil society should play a central or renewed role* in the management of techno-science in/and society is also an interesting normative posture and a heuristically illuminating notion. It is decisive, in particular, if it means *the less organised but nevertheless active and burgeoning 'mass of the population' trying to manage its own problems* – alongside the world of business (and its norms and logics), alongside the world of the organized institutions of the democratic state (from courts to administrations, from science and university to regular democratic elections), and alongside the new global institutions that now manage a large portion of world relationships (like the WTO or the WB). If the idea is to favour the active presence of 'the population' in the management of the *polis*, if it is to help that part of it to articulate its doubts and hopes, then the notion is certainly central.

8.5. 'Civil Society Organizations' (a notion used by the EU) but also *NGOs, users, consumers, patients, women, indigenous people, and sometimes citizens or activists are the most common denominations used to make 'civil society' exist in policy terms*. Scientific societies, academies and a whole set of professional organizations are sometime included too, but the 'traditional' representatives of socio-economic groupings (workers unions for example) figure rarely. This leads to a question discussed during the workshop: the profoundly diverse and large spectrum of entities that can be put under the heading of 'civil society organizations' -- and the political meaning of any selection, of any specific translation. Part of the research program details what can be done in terms of research around this question.

8.6. A final remark: since the late 1980s, the need to have civil society participate in all decisions can be found everywhere. It has become central to a new form of *governmentality* that combines a universal call for a government of the self and extended regimes of rationalization and scanning of populations. This governmentality now runs from the detailed management of medical doctors to that of patients and migrants. Medicine has become increasingly managed by the state or insurance companies, for example, at the very moment patients evolved into consumers / activists. 'Technical analysis is extended from diagnostic classifications to the cost-effectiveness of procedures,' one of the participants wrote in preparation for the meeting, 'and the resultant power is exercised over doctors rather than patients'.

These new forms of governmentality were initially conceived in the world of business and finance and they are now at the core of any shop floor management and of most governments' action. They can also be found at the core of most international organizations of the World Bank type, which played a key role in their generalization.

9. About knowledge and the discursive order of today's world

9.1 *Over the last decades, it seems that a new discursive order has emerged and spread*. It is organized around words or expressions like governance, responsibility, transparency, accountability, sustainability, precaution, consensus, ethics, risk society, knowledge society, civil society, etc. These notions have become obvious and transparent; they have become the invisible, basic bricks through which we build our world, even if they were nearly unknown (at least with such broad meanings) two or three decades ago. Most of them can be read as ideals that are rich and positive and that define interesting norms. It should be realized, however, that using them carelessly might result in neglecting to ask other decisive questions (responsible or accountable to whom and in which legal frame) or might result in neglecting to use alternative categories or other ways of seeing the world that might also be of great interest, thereby impoverishing us. In short, the situation might be damaging if they were to become slogans – a fear one might have.

9.2 For example, the use of the word *society*, in the famous expression *knowledge society* in the Lisbon agenda, opens more dreams than that of *knowledge economy* (but is it significantly different? And do we want it to be different?) It comes after other expressions like service or information society – and it induces us to 'dream' more that *technological society*. It is 'above' craft society, it is 'richer' than industrial or post-industrial society, it is not as narrow as information or network society -- and it helps avoiding market societies. In a way *it mixes them all, transcending them, making our world more glamorous*. However, all other expressions have their pertinence and alternating between them would be wise for policy makers who do not want to get caught within catchwords.

This explains why we propose a large research program around what we term 'the discursive order' of our societies (see part 3, section 7 below, and annex 3, point 3.6. to 3.8.)

Part Three

Main lines of a research program in history

Main lines of a research program in history

1. This program is designed to mobilize history, to take into consideration what happened over extensive periods of time in order to envision alternative solutions to present dilemmas.

1.1. This program should be opened to historians of science, technology and medicine. These alone will not suffice, however, and the call *should be opened to all historians and to other social scientists*. If the objective of the program is to open our eyes, to build more global readings and speculate on what is going on now; if the aim is not philological but exploratory and meant to identify the diverse forms of life that were invented throughout history in the making of knowledge; in short, if the aim is not primarily antiquarian but genealogical and intended to question the reassuring simplifications and strong certainties in the present, then all forms of history are central and collaborations with political scientists, sociologists and anthropologists should be involved.

1.2. A central lesson from recent science studies and STS has been that detailed studies of historical cases, controversies and 'affairs' are necessary to lay out the complexity of a situation and the variety of claims to truth and justice. For this research program, however, the interest in detailed case studies *will be at its apex only if they are framed in a systematic comparative way* and *through explicitly conceived questions*. As usual, this kind of work is not easy because ontology differs over time and because categories do not have universal and stable meanings (think about 'consumer' or 'civil society' as categories, for example, when trying to understand the development of regulations of fertilizers in the late nineteenth century or vaccines in the last century).

1.3. The choice of temporal frames to be mobilized to evoke the present in a comparative way is of utmost importance and should be made as explicit as possible. In many narratives about the present, the contrast is often made with an ill-defined 'former era' or 'previous period' that is either idealized (the present then appears as a world of new difficulties and new injustices) or symmetrically made quite dark (the present then looks brighter with more freedom and possibilities). To avoid both of these simplifications, we believe that *time scales for comparison should be carefully chosen and systematically varied*. The program should thereby not only invite comparison of the present with the decades of the Cold War – which is a fairly common tendency – but also consider (1) longer time periods, for example the century that opened by what is commonly called the second industrial revolution, notably because that regime of science in society is still partly with us; (2) shorter frames, for example the years 1975-1990 (that period was primordial in the redefinition of the financial regulation of science and in the changes of intellectual property rights), or the decade that started with the collapse of Soviet Union, or the more recent Bush and neo-conservative era with less multilateral commitments for the environment and the return of a strong form of national sovereignty.

1.4. The geographical/cultural frames through which the comparisons should be built also have to be considered with the utmost care. In particular, the program should ask for *frames of analysis that are not only defined by history, chronologies and main categories of the North of Europe and the United States*. They should also be conceived from chronologies, questions and histories of the European periphery (Spain, Portugal, Greece or Eastern Europe for example) and of various parts of the South (China, India and South-East Asia, Africa or Latin

ple) and of various parts of the South (China, India and South-East Asia, Africa or Latin America). It should never be forgotten that Europe was largely built through its interactions with the 'rest of the world' – that it is important to write the history of Europe *from the outside looking in*.

2. Sites and regimes of science and knowledge production in/and society over the last centuries

Under this heading, we would like the program to ask for projects that consider the forms that conflicts took in the production and proper definition of knowledge, that analyse *how competing sites of knowledge production developed* and that consider *the intense traffic which existed in the past, and still exists today, between these many sites* -- notably between 'popular' sites and official academic and industrial sciences. The questions are thus: Where was knowledge produced? Who was producing interesting knowledge and for whom? How did exchanges take place?

The policy related aspect behind this first set of questions is that most people today agree that cross-fertilization between different ways of producing knowledge is a good thing in 'knowledge societies.' The confrontation is not easy to organize, however, since there is no transcendent point of view from where to 'objectively' weight the interest of the various proposals – and also due to the asymmetry of power between science and other forms of more 'subaltern' knowledge. Accurately managing such potential chasms is of utmost importance for political terms, however. The research program should thus ask for projects that carefully study interactions of this kind and that consider how some solutions emerged as obvious, how others were discarded, how certainty and their publics were ultimately manufactured.

Doing this may also help avoid, on the one hand, the too simple, romantic and happy vision of a world built bottom-up in which 'small and marginality is beautiful,' albeit a world that is unfortunately destroyed by powerful institutions; and on the other hand, the lack of doubt that characterizes most official and industrial science, what they do and their managerial top-down attitudes that rarely anticipate that there are many things they do not know.

More precisely, what the call should stress is:

2.1. *The importance of mapping the variety of the social spaces in which knowledge were produced historically* (from radio and natural history amateurs and from non-proprietary forms to academic or military sciences).

The central theoretical point is that knowledge has never been reduced to Science despite claims to the contrary within academies and elite. The aim of the program should be to help document and re-emphasize this decisive fact; that is, to help us remember how people produced newly relevant knowledge, forms of ingenious know-how, connections and databases in various contexts and around very different preoccupations. The call should also ask projects to consider, with a comparative tone, if new forms of knowledge production have appeared in recent decades, if they are linked to new scientific and technical means such as the Internet and world wide web, if they are dependent on new forms of political action and if they are correlated to new techno-industrial and economic-financial situations -- including such transforming features as new systematic risks, new modes of domination or new forms of social organization.

2.2. *The importance of mapping the various Science formations that developed historically*

(mathematical approaches versus pragmatic engineering practices, field science versus laboratory, clinical versus experimental medicine); *the overall hierarchy that organized them*, the way some came to dominate and define *Science*; the values they promoted, the way they helped reconfigure the natural/social world; their relative power relationships, the way they were used politically or economically and the way they were articulated on social relations. In the early Cold War period for example, the reductionist, physical and material sciences dominated the other sciences – largely because they were closed in the military industrial complex, its interests and modes of working – and they gave Science its dominant flavour. Inside that group, and with quite lavish military/state support, high-energy physics had the upper hand symbolically. This translated to a stress on big machines but also on the purity of science, on its exclusiveness and on the intrinsic superiority of non-immediately useful knowledge. Nowadays, technologically and market-oriented IC and bio-nano-sciences – but also modelling and simulations on the one hand, economics and management sciences on the other – compose the knowledge that counts, the knowledge that dominates in media and imaginaries, on Nasdaq and in economic terms. Of course, this new constellation is part of a regime of science in society that has drastically changed.

2.3. *The complex exchanges that went on between these sites, modes of knowing and interests* should be the third series of study that the research program should ask for. There is no doubt that industrial techno-sciences have always relied on university and academic work to develop their products but they also relied on a myriad of amateur spaces. This is true for radio technologies in the first half of the century for example, and for software today. Similar remarks could be made for medicine and natural history, for example the analysis of ecosystems that first emerged among local groups of amateur naturalists. Usages, the way artefacts are put to work and locally appropriated, has also been a constant resource for companies in their innovative processes. What the program should call for is to gain knowledge of these situations of intense traffic and to highlight the many paths they followed.

2.4. Finally, *the program should ask for projects that analyse the place occupied by the South in the development of the successive regimes of science and society*. Knowledge is not just built in the centre of the empires and then exported. On the contrary, it often emerges *because of questions posed by the encounter*, by the emergence of new natural, human and social situations – and, as far as the North is concerned, by the need to control populations and territories. In such colonial (or post-colonial) contexts, knowledge is elaborated by acculturated indigenous people, by immigrants that have partly become native, by marginal people, by *savants* transplanted in the new sites, etc.

3. Restriction, control, appropriation and forms of mastery over knowledge and science

Under this heading, we would like the program to ask for projects that consider the forms that conflicts took in *the appropriation and control of knowledge throughout history*, projects that document the importance of and what was at stake in these battles, *the technologies available to manipulate knowledge, to restrict access to it and/or actively build ignorance*, but also the variety of *cités de justice* (of worlds of reference) that grounded these diverse knowledge programs – from patient's relations to doctors to popular epidemiology on the web and the protection of indigenous, traditional knowledge today.

The call should ask for projects to consider the mutable and crucial nature of relations that official science, notably academic, military and industrial sciences, established with other actors and the various terms of trade and commodity forms that appeared. To name a few,

these have included such principles as sharing information or results, recognition of the work done by non-professional people, re-appropriation (with or without acknowledgment), but also, and quite often, instrumentalization and crude spoliation. Key terms also include the management of secrecy, the making of sequestered or classified knowledge, the making of private knowledge through patents and intellectual property rights. The call should notably ask for projects considering relations at the local level (the identification of new risks or environmental hazards, for example), but also global North-South relationships (the biodiversity or the management of disease). In other words, the second group of key questions should include: How was access to knowledge distributed or controlled? Who made knowledge accessible to whom? Who restricted the access to it and how?

What the call should more specifically ask for is:

3.1. *Comparative studies and long-term histories of military modes of appropriation and control of knowledge, and of national protection of 'strategic' sector of economic activity*. This aspect remains essential today, as demonstrated since the end of the Cold War (and even more explicitly since 9/11), even if that dimension does not appear so central in the EU frame (which is partly understandable).

3.2. *Comparative studies and long-term histories of patenting and intellectual property rights*. Because of the decisive role rules of patenting and IPR have played in international relations, these histories should be precisely conceived in geographical and temporal terms and include as many sectors of knowledge as possible (typically, a country could be very restrictive on IPR in pharmaceuticals and quite open for mechanical artefacts, and change policy as soon as it felt economically stronger). Of course, these stories are linked to major political and economic choices and to particular political economies that should be precisely defined.

3.3. *Comparative studies and long-term histories of forms of control and appropriation other than IPR and patents* -- for example histories of trade secrets and the circumstances when they were considered more efficient than taking property rights; but also studies of *the deliberate building and spread of false knowledge, rumours and disinformation*. This latter item is essential, as every historian knows, in considering early warnings of environmental pollution or sanitary crises or in considering the establishment of safety norms of certain products (tobacco, pesticides or asbestos for example) or of food quality.

3.4. Again, the program should ask for *projects that analyse the role adopted by and given to the South and its populations in these processes of knowledge production and control*. Here the systemic inequality of the exchange is paramount. Quite often, for example, risky experiments were first tried on local populations in the global South – on their productive practices (despised by northern scientists and often with disastrous consequences), on their habitat and social forms of life, but also and massively on their bodies – to 'eradicate' pandemics for example, or to test new molecules. This situation has not disappeared, even if most people in the North are not fully aware of it.

4. The many forms through which knowledge and techno-scientific products are 'regulated' in democratic societies

A characteristic feature of democratic societies is that parallel and independent institutions 'run' them. That is true for what we could call the various 'modes of regulation' (understood in the broadest sense) of knowledge and techno-scientific products. Historically, such regulations have been performed by governments, parliaments and courts of justice; by

tions have been performed by governments, parliaments and courts of justice; by administrations, agencies and expert committees in charge of health and safety; by laboratory testing, the deployment of technical artefacts and the standardization of practices and controlling tools; by insurance companies, the invention of codes of ethics and by social activism -- but also and centrally by markets that offer free consumers, according to specific rules, products derived from new 'science.'

The aim of the program is to address the complex *power relations that these different regulatory modes and institutions maintain with each other and the most likely consequences each mode tends to generate.* The fact that each institution or form has its own bias, that it considers the questions from its own perspective and aims and that it rarely leads to the 'same result' as the others must be kept in mind. Obviously, the question is politically decisive and of importance for policy. In short, the third group of questions should include: How do we describe the various regulatory modes of knowledge in society over time? How have knowledge and techno-scientific products been evaluated, and who measured their consequences? Who arbitrated the terms of trade and what means were used in each context to decide between conflicting interests?

What the call should more specifically ask for is:

4.1. Projects ready to historically consider the following: (1) The way each mode tends to regulate, the kind of solution it tends to favour, the systemic effect it tends to induce, in addition to the people it leaves out and the people who are 'forgotten.' (2) The respective weight each mode has/had in different situations. Because of the diversity of probable results, disputes have been common and could be precisely documented. (3) The way each kind of regulatory process positioned itself with respect to values and norms of justice such as the potential negative consequences of the technology, the identification of new risks, the national interest, etc. (4) The means and institutional frames that were invented over time to deal with new kinds of accidents or pollution, with new fears and hopes, as well as how they were selected.

This kind of work should be accomplished with detailed case studies where specific knowledge, products or processes were contested, and by systematizing the results. In short, in choosing examples from agriculture, medicine, environmental concern or industrial production, we would like the projects to consider novel concerns and the forms of regulatory body developed therein, as well as the frequently conflicting and agonistic relations between such bodies.

4.2. Effective regulations do not only result from norms, expert decisions or the creation of new controlling bodies, and as such, the studies should in no way be reduced to them. Equally important are the actual social practices concerning techno-scientific products, the systemic effects, the way decisions are enforced or ignored and if they meet their goal. Historians are often struck by the recurrence of the same policy questions, by the fact that safety standards have a long and repetitive history for example. Long-term historical descriptions are needed in order to understand what is going on. For instance, long-term histories of the management of the 'same risks', of the way professionals work on the shop floor or in their administrative department or agency, their complex relations to market forces and to the public space in the implementation of rules, as well as studies of the politics of making and announcing decisions. In other words, the program should ask for studies that focus, as one of the participants to the workshop wrote, on 'the actual practices of the many actors involved – within and out of regulatory frameworks – and that place economical actors and their interests at the centre of the analysis – and not only or mostly scientists and policy makers.'

4.3. Lastly, the call should ask for projects that consider *the way in which any production of top-down rules, norms and controls is regularly matched by a concomitant production of deviance, alternatives and heterogeneities*. The production of norms that define acceptable risk or damage, as do the production of legitimacy or of sites trying to make people 'accountable,' often have a kind of symmetry in the production of alternative values and sites where independent practices emerge. This may be evoked with music, wikipedia or free software today. In other words, we should neither overestimate the significance of audit society nor presuppose that technocratic approaches succeed. In democratic societies, there are often as many challenges to science, business and official norms as are successfully controlled. This phenomenon should not be seen negatively but also positively, as a central form of freedom and creativity in knowledge societies.

5. The variety and importance of 'amateurs' knowledge and forms of life

Under this heading, we would like the program to consider *the various types of knowledge and figures of non-professional agency that emerged over time around scientific, technological and medical practices and applications*.

What the research call should more precisely stress is documentation of:

5.1. *The variety of situations in which 'participation' in knowledge production and regulation occurred and the variety of meanings that actors attributed to it*. This implies attempting to grasp the huge number of people and organizations that produced independent knowledge in the past and identifying the various forms of ties people formed between themselves; the diverse forms of their investment and the complex games that were played between insider and outsider attitudes, between collaboration with official science and opposition. Act-Up, to take a well-known contemporary case, plays on many fields in order to have its questions taken up by politicians and companies, whereas AFM (Association Française des Myopathies) mainly invest in normal science and business.

The research call should ask projects to document the various kinds of relations these groups had to media and the theatre of politics on the one hand, and to business, state, international organizations and foundations on the other. Research should also document networks that were more local, and perhaps less visible in the public sphere, and identify the media (publications, exhibitions, web) these networks used to accumulate their knowledge and to make it public or available.

The stress should be on strictly documenting historical cases, as comparisons with the past might be a particularly efficient key to decipher the apparent specificity of today's blossoming of new 'civil society organizations.'

5.2. *The changing role of figures such as amateurs, patients or activists*. If we take medicine and healing practices (a major topic today) as an example, 'the patient' has oscillated from the figure of the independent person who manages their own life, body and illness using folk (or their own) knowledge to that of a mere consumer of drugs and science, in a reductionist and technophile way. This story involved the 'healthy person' -- recently transformed into a 'person at risk', by the way -- and the (return of an) 'old' figure, that of the patient as the patron of the medical doctor or the research institution. Finally, the 'patient' also moved between being a mere interchangeable atom (in the national state-run welfare systems or in the health systems run by insurance companies) and an active agent 'freeing' themselves from that system, constituting their own 'patient group' -- and a new 'identity' in the process.

tem, constituting their own 'patient group' -- and a new 'identity' in the process.

It might also be interesting for research projects to consider the articulation of these notions (those of patient, consumer or activist, for example) with two more classical categories, that of *citizen* and that of *subject* (in their diverse philosophical meanings). Introducing the notion of citizen, for example, will help put forward broader questions, such as that of the link between representative democracy, the nation frame and citizenship. Presently, the alternative notion of *bio-citizen* is precisely trying to detach the citizen from the politically defined 'rights and duties' that are linked to a group and a territory -- and to consider instead its articulation with the categories of consumers, markets and patients.

5.3. *The way 'knowledge' differs and the way the nature of knowledge produced in each context varies.* If we again take 'patient group' knowledge as a case example, it may be asked: To what extent does it differ from one group to the next? To what extent does 'knowledge' vary according to context (that of a consensus conference, of a web site, of a tribunal, of a protest, of an administrative or of a research frame)? How does it compare with knowledge developed in the clinic, in experimental scientific medicine or through official statistics? In what way is it more 'existential' or more 'biographic', that is, to what point does it focus on the 'eco-system' of the illness (as was the case with natural history knowledge produced by amateurs in mid-19th century Lancashire compared with the more systemic kind of knowledge produced by natural history professors)? To what extent is a deliberate acculturation to scientist knowledge observable and under what conditions do these groups try to, and become, as scientific as official science, using techniques and norms that barely differ from those of academia? What are the consequences of these differences and to what extent do they matter when entering a phase of negotiation between groups? To what extent is it essential to align oneself with dominant knowledge to succeed in negotiation? To what extent and on what occasions does an alternative strategy work better?

5.4 Concerning the more recent period, the following questions might be considered: How does the explosion of happy discourse on the coming of age of consumers and patient-activists connect with the new political economy we are in? Which politics and political economy are associated with it? And the growth and transformation of individualism, notably through the bio-production of individuality? Historically, the battles for autonomy (of groups and individuals) have been ways to weigh on official knowledge, on legislative action and administrative controls, to resist the destruction of the environment, to limit the 'freedom' to buy and sell dangerous products, to debate what would constitute a more neutral institution (public versus private, state owned versus private, scientists versus engineers, academic people versus practical people), etc. Is this still the case today? What are the differences?

6. Governmentality and management through knowledge and science

Under this heading, we would like the program to consider the various historical figures that fall into the 'government of people and things', and in particular the way Michel Foucault's maxim *faire vivre, laisser mourir* has been instantiated and how it has evolved.

6.1. What the research call should first ask for is to document *the forms of governance and governmentality of science, technology and medicine themselves*, of health and innovation, and the effect that government had on the knowledge produced, on its dynamics, on the kind of questions ignored, etc. To understand the specific forms of today's management, it might be of particular interest to go back to earlier forms of governmentality, to try and compare them – in a systematic manner and as a heuristic tool – with historical forms.

6.2. This question is of importance for research in the (hard) sciences and engineering but particularly for social sciences. More precisely, since social sciences might now be an improper term, for understanding *how a new kind of knowledge was built; a kind of knowledge that claims, without clear accountability, to know what is the best, efficient, normal (unavoidable?) way to build 'good knowledge' and rule societies,* of managing social relation, of promoting economic development, of articulating the relations between North and South – and of making people accountable.

6.3. Recently, *this kind of 'knowledge for government' seems to mean a new set of norms and values, of a new set of ontologies, institutions and methods that define what is proper and good*. The hypothesis we began with – an idea to be studied as such in the program's frame – is that this new way of defining knowledge mobilizes economists, mathematicians and experts of management. It mobilizes them in new kinds of institutions (the World Bank of McNamara in the 1960s, for example, or the new kinds of (typically) Washington-based think tanks of the 1970s and 80s). It employs its own array of free-lance people producing the knowledge needed for that *good and global governance*, people that are to replace traditional administrative and political elites and that are often trained in parallel, not to say opposition, to university standard practices, norms and values. This is particularly witnessed in the South. Anthropologists, ecologists and economists are thus called to work under specific constraints of time and format and to deliver precisely defined products that their hierarchy (in the Bank or the think tanks) re-processes to produce the knowledge that matters. This progressively leads to the creation of a new 'class' of producers of knowledge, quite different from academics and other 'users groups,' and of a new knowledge.

6.4. Noting the particular *place of accountability as a category in today's governance*, another central question for the program might be: How did 'accountability' emerge as a key notion and what did it replace? A hypothesis is that it comes from Cold War culture (the chain of command was replaced quite early on (McNamara again) by individualized auditing, creation of tools for following soldiers one by one, new procedures of rationalisation of budget procedures, etc.). Another idea is that it comes from the management of colonies, from managing people and environment in the global South. The future of our university structure might be located in what has been put into practice in the South and that made people less or non-tenured, essentially working on contracts and thereby 'more accountable'. A third question might be which other kind of accountability was lost or displaced in the process and which kind of value and knowledge disappeared?

6.5. Finally, we thought the program should ask for projects describing the various forms adopted by a*udit cult and culture, and the way it has evolved. Effects on knowledge and knowledge institutions should be considered*, that is consequences of changing audit culture on the evaluation and legitimation of knowledge, on universities and academic cultures and on the humanities in particular. Questions include: What is the link between audit culture and techno-science (with its practices of standardisation and of equating 'the real world out there' with 'the result of its measurements')? What is to disappear, in terms of sorts of knowledge, if audit culture becomes the only rule?

7. The discursive order of the science/society relation in the past and the present

The *categories* that politicians, policy makers, media and social scientists use to describe the world they are in, the obvious set of expressions, notions and catchwords that constitutes the

lenses through which they collectively see the world and conceptualise actions are to be studied. Because of the performativity of language, it is interesting to study the 'scientific' categories through which 'the world' is apprehended and brought into existence. This kind of work – *understanding the discursive order of the past and of today's regimes of science in society* – should constitute a key dimension of the proposed program.

There is twofold interest in this part of the program. One is, of course, to try to understand *the forms of rationality that underwrite the world people inhabit*, to try to trace how they came into existence, to identify the categories that emerged, and the ones that disappeared, in the agonistic field of narratives and memories. This involves considering the social and political situations that allowed their final configuration, this involves considering who promoted them, how they were re-appropriated and by whom. In this sense, this work is not denunciatory nor philological but intended to better understand social change. The second interest, essential for social scientists and policy makers, is to help adopt *a more reflexive position*. That is, it is to help achieve a certain distance and to be better prepared to resist the self-evident nature of the categories that surround us.

7.1. A first aim of the program might be *to document if a new discursive order has emerged in the last few decades* (as it is often claimed) and then to also document the prior orders. In this frame, the program could ask for projects that consider some of the key expressions, notions and categories that made these discursive orders. If we start with today's dominant vocabulary, two groups of notions could be proposed:

(1) The first one has to do with notions that (apparently) merely describe the world we live in. These include expressions like 'risk society,' 'knowledge society,' 'civil society,' 'audit society,' 'globalised world,' and also, as we have already seen, 'consumers,' 'users,' 'patients,' 'lay-person,' 'lay knowledge,' 'robust knowledge,' etc. Writing genealogies of these, and comparing them with former notions, might produce interesting reflections.

(2) A second group has to do with the vocabulary through which public action is now framed. These include 'governance' (and 'good' or 'global' governance'), 'responsibility,' 'transparency,' 'accountability,' 'participatory politics,' 'consensus', etc. Again, identifying genealogies and displaced notions might be of major interest.

Another group of notions are of utmost importance *for science and for society*. They are the expressions and words that historians of science and technology have encountered since the 19th century in their archives, expressions and words that have been decisive in both worlds of technology and social values, that simultaneously have techno-scientific meanings and moral/ethical ones. Namely: 'code,' 'standard,' 'value,' 'norm,' 'measure,' 'balanced,' etc.

7.2. As an example of such a genealogy let me trace the notion of *governance*. A story of the recent emergence of *governance* in our vocabulary would likely start in management and business circles in the late 1960s, because managers were then losing their ability to properly run the shop floor (at Fiat in Italy, for example, or at General Motors in the United States). They started to conceive other modes of managing production, including modes that relied on participation, shared and public criteria for assessment, decisions made collectively by employees, etc. The notion became more explicit and took on new meanings in the late 1970s and early 1980s when demands for *transparency* were made by managers of pension funds, which were then in a period of full expansion. Transparency was demanded because of the renewal in shareholders' direct involvement in business (this was the time when shareholders started to take over as the key people in business). Because these people were powerful, and because they needed other tools to precisely monitor what was done with *their* money, new

techniques, but also a whole range of categories linked to what we now call *governance* moved to the forefront. Next, *good governance* (a notion with a more normative bend and a larger field of application) moved into politics via the discourse of key international institutions such as the World Bank. It then appeared in the rhetoric of most NGOs working in the South and in the rhetoric of states receiving money from the Bank in the South (as they themselves had to promote good governance to be eligible to receive funding). A later stage of this evolution took place in the early 1990s at the London School of Economics with the notion of *global governance.*

In order to be richer and more comprehensive, this narrative should also question the links between the growing blatancy of (good or global) governance in the 1980s and the (re-)emergence of 'individualism' and 'identity politics'; with the victory of economic liberalism; with the transformation of the social body itself and its norms, etc.

7.3. Another strategy to start analysis of these discursive orders as they developed in the past and the present -- as a parallel to the genealogical approach -- could be to look at how they were used and to consider the context of their usage (in certain contemporary EU official texts, for example, knowledge is made a commodity and creating a 'knowledge society' mainly means tying academics increasingly to innovation). Or to consider how the reality they are intended to describe could be challenged (in what sense, for example, could we say that *knowledge societies* are more prominent today than during the Cold War?); or how could the notion be reframed (we could defend the idea that a 'knowledge society' is about the confrontation of various forms of knowledge in a democratic order) or be 'replaced' (are we not living in 'experiential societies' for example, rather than in 'knowledge societies'?).

7.4. Another central topic that this part of the program should ask for is *how the (practical as well as rhetorical) conception of risk has become decisive for modernity.* A key hypothesis might be that since the 19th century there has been an organic link between the active social/discursive production of risk (as a material reality and as a social/ technical challenge to be faced by science and the social body) and the constant invention of new forms of government, of people and things. In other words, the regular making / denunciations of risks and of the new challenges societies have to cope with might be at the core of the perpetual invention of novel institutions and of *the standardization* of modern societies. It is not that there have always been regulatory frames that were available and were adapted to the (objective) situations emerging from new technical innovations, in the state apparatus or in industry for example, but that the active conception of risk was the condition for the emergence of modern managerial institutions (administrations and agencies of various kinds, technologies of products' control, conception of sustainable development).

8. How to conceive of the products that the research program asks for?

8.1. During the workshop, we considered *the nature of the product that such a program in history should ask for*. Academic reports, books and articles of various kinds are obvious answers. We thought, however, that this would be insufficient and that more interesting things could be done, such as exhibitions or films. The interest of asking for this kind of product is that master narratives are less 'natural' in such frames and that parallel narratives are easily developed. In other words, collaboration with an infinite variety of actors (natural and social scientists, designers and film makers, lobbyists and activists, policy makers and industrialists) is required to map the sources of disagreement and dig out the relevant documents; and the confrontation between points of view could be staged in a productive and fruitful way.

8.2. People in the workshop were quite aware that such a recommendation is not often welcome in academic circles. Outreach programs and extramural collaborations are rarely considered legitimate by most intramural auditing, by peer review systems and universities. We thus asked if the program should not be *the place in Europe where a funding stream could be associated with the staging of such critical debates about science, technology and medicine*. This would contribute to the mixing of historians, social scientists, designers and various 'stakeholders' – and would help show how central this kind of work could be in establishing stronger 'knowledge societies.'

8.3. A third recommendation is to consider the development of another type of product. This could be *the active building of an archive for some major decision*s *and/or regulations*, which would include implementation, social (mis-)appropriation and independent practices and uses. The interest is that in order to do the job properly the questions of the 'documents' to be saved and of the kind of narrative they allow (and forbid) would have to be contradictorily investigated by all relevant actors and pragmatically solved. This move would help rebuild institutional memories and group reflexivity. Such a project would require a few historians from different areas and an IT person. Heuristically speaking, this project seems to be of major importance.

8.4. Finally the question was raised if a *history office within the directorate could be envisaged*. A history office could serve to follow and help implement these diverse projects and also to help stimulate positive discrimination in favour of history. We felt that this might be needed.

Annex 1 : Analytical Summary

Annex 2 : Reflections on history as a discipline and its interest and limits for addressing questions of policy

Annex 3 : Proceedings of the workshop, as well as of the preparation for and the context of the workshop

Annex 4 : Texts received from the participants

Annex 5 : List of participants

Analytical Summary of Part Two
Challenging implicit assumptions

1. About science in its relationships to society

1.1. Science is made by human beings living in society
1.2. Science is not only, or principally, driven by its own internal logics
1.3. Modern science is not only 'knowledge' but practical, technologically-oriented activity
1.4. Modern science has always been linked to powers of all kinds
1.5. Science is not one thing, society is not one bloc

2. About the relationship of modern science to technologies and progress

2.1. Science is not a simple and neutral vehicle for progress and a better world
2.2. Science is not often attentive to the consequences of what might come out of the Pandora's box it is constantly (re-)opening

3. Concerning innovation and science policy

3.1. A common tendency is to keep a kind of linear model of innovation
3.2. Another tendency is to consider that the opinion of non-scientists is never well grounded
3.3. A third tendency is to think that the world is becoming anti-science and irrational
3.4. Criticisms, refusals and oppositions to science, technologies and their direct and indirect effects have been essential for the development of safer technological systems

4. About the science / society relationship as seen from the way democratic societies function

4.1. In democratic societies, an essential tension exists between 'deciding on the basis of scientific knowledge and excellence' and 'deciding democratically'
4.2. More generally, democratic, modern societies are quite complex because they call for, and cherish, a multiplicity of independent and parallel regulations
4.3. Tensions are not mainly situated with 'science' on the one side and 'lay and ignorant people' on the other
4.4. Techno-scientific knowledge and products are regulated by institutions that work according to different principles
4.5. Power relationships and interests are central in the science business
4.6. Science *de facto* has a politics but without the need nor the usefulness for democratic mediation
4.7. The policy followed by the EU over the last decade was to foster wide ranging participation in the decision processes – a positive step

5. About the changes that seem to have occurred over the last decades

5.1. The cursor separating science as 'open knowledge' from science as 'private good' has moved towards a reinforcement of the latter

5.2. This might mean a change in the finality of universities, in their core values and in the normative definition of what 'knowledge' is
5.3. Social relationships and values have undergone parallel and as drastic change
5.4. The 'dominant' sciences, the techno-scientific activities which put their mark on societies have changed too
5.5. Today, there has been dissolution of the strong alliance built in 19th century between politicians, administration, scientists and economic elites in the nation frame
5.6. Today that dissolution and recent techno-scientific successes produce two opposite kinds of reaction, a technophilic reaction and a technophobic one
5.7. In line with these changes, a new definition of the political has emerged

6. About knowledge and the variety of its sites of production

6.1. Science is not a unique formation, a unique and unified world
6.2. Science is only one mode of knowing among many other modes
6.3. There are presently strong claims that 'amateur' way of making knowledge, this bottom-up, or user-driven, way of working is gaining ground
6.4. The knowledge thus produced might be of quite a different nature from the one produced by the sciences

7. About the question of appropriation of knowledge

7.1. The question of IPR and patents has become a lively political question in Europe
7.2. It seems wise, in policy terms, to consider what the effects of various forms of IPR and patents could be, notably for Europe in its competition with other regions and countries
7.3. The question of IPR should not be treated as a non-choice or a mere technical question
7.4. 'Knowledge societies' have everything to gain from accepting a variety of values and norms

8. About participatory politics and governance

8.1. 'Participatory politics', 'dialogic and technical democracy' are interesting and powerful expressions in normative terms
8.2. However, conceiving decision in modern democracy mainly as a form of 'organised conversation' that should end in a consensus is misleading
8.3. Allowing people to believe that 'participatory politics' could become the major mode of regulating techno-science and techno-industrial products is misleading too
8.4. The parallel idea that civil society should play a central role is illuminating in normative terms
8.5. NGOs, users, consumers, patients, women, etc. are the most common denominations used to make 'civil society' exists in policy terms; they might be problematic terms
8.6. New forms of governmentality have emerged in parallel to the deployment of participatory politics

9. Concerning knowledge and the discursive order of today's world

9.1. Over the last decades, it seems that a new discursive order has emerged and spread
9.2. 'Knowledge society' or 'risk society' should be used with care by policy makers

Analytical Summary of Part Three
Main lines of a research program in history

1. This program is designed to mobilize history

1.1. The call should be opened to all historians and, more importantly, to other social sciences
1.2. Detailed studies of particular historical cases will remain central but such a program will be interesting only if framed in systematic comparative approaches
1.3. Time scales for comparison should be carefully chosen and systematically varied
1.4. The program should ask for frames of analysis that are not only defined by history, chronologies and main categories of the North of Europe and the United States

2. Sites and regimes of science and knowledge production in/and society over the last centuries

The program should ask for projects that map:

2.1. The variety of the social spaces in which knowledge were produced historically
2.2. The various Science formations that developed historically
2.3. The complex exchanges that went on between these sites, modes of knowing and interests

3. Restriction, control, appropriation and forms of mastery over knowledge and science

What the call should ask for is:

3.1. Comparative studies and long-term histories of military modes of control of knowledge and of national protection of 'strategic' sector of economic activity
3.2. Comparative studies and long-term histories of patenting and intellectual property rights
3.3. Comparative studies and long-term histories of the deliberate building and spread of false knowledge, rumours and disinformation
3.4. Analyse of the role taken by the South and its populations in these processes of knowledge production and control

4. The many forms through which knowledge and techno-scientific products are 'regulated' in democratic societies

What the call should ask for is for projects studying:

4.1. The relations that different regulatory institutions maintain with each other and the most likely consequences each mode tends to generate
4.2. The effective regulations, the actual social practices around techno-scientific activities and products, the way decisions are enforced, ignored and reach their goals or not
4.3. The way in which any production of top-down norms and controls is regularly matched by a concomitant production of deviance, alternatives and heterogeneities

5. The variety and importance of ‘amateurs’ knowledge and forms of life

The following themes and questions should be considered in the program:

5.1. The variety of situations in which ‘participation’ in knowledge production and regulation occurred and the variety of meanings that actors attributed to it
5.2. The changing role of figures such as amateurs, patients, activists, etc.
5.3. The way ‘knowledge’ differs, the way the nature of knowledge produced in each context varies

6. Governmentality and management through knowledge and science

6.1. The forms of governance of science, technology and medicine
6.2. Today’s knowledge for government seems to mean a new set of norms and values, of ontologies and methods that define what is proper and good knowledge
6.3. How did accountability emerge as a key notion, and what did it replace?
6.4. The various forms taken by audit cult and culture, the way it evolved, and the effects on knowledge production

7. The discursive order of the science / society relation in the past and the present

7.1. A first aim of that part of the program might be to document if a new discursive order has emerged in the last few decades
7.2. Genealogies of key notions – like governance or civil society – should be asked for
7.3. Other strategies should be tried, like considering contexts of usage
7.4. Other topics should be tried, like: how the practical and rhetorical making of risks has become decisive for modernity?

8. How to conceive of the products that research program could ask for?

8.1. The workshop stressed the importance of considering the form the final products should take (book, film, exhibition, …)
8.2. We thought that the program could be the place in Europe for a funding stream associated with critical debates about science, technology and medicine
8.3. Another recommendation was to consider the possibility of actively building an archive for one or two major decisions / regulations
8.4. The question was finally raised if a history office within the directorate could be envisaged.

Analytical Summary of Annex 2
Reflections on history as a discipline, its interest and limits for policy questions

Analytical Summary of Annex 3
Proceedings of the workshop, of its preparation and context

Annex 2

Reflections on history as a discipline and its interest and limits for addressing questions of policy

Since the workshop was attended predominantly by historians, and since the call of the Science and Society Directorate was to history, a few words on how we perceived our place in the process are in order.

1. *Naturally, history does not have an epistemological advantage over any other science*; no human can occupy God's position and no place can be imagined from where *the* truth could be told. Everyone is situated in time and space, everyone has a limited vision of the world and that defines, in part, what they can see. This is also true for historians. On the other hand, *not everything goes*, not everything has the same value and not everything matters in the same way; therefore certain results, certain claims and narratives are more interesting, more important, more to the point than others. What makes them important or more pertinent is contradictorily decided by humans and that is precisely what is at stake in the social, political, intellectual public sphere (in terms of norms, methods and values). In other words, since no one is absolutely right mobilizing other visions, and debating them publicly and contradictorily, is the only antidote. As is, for example, mobilizing historians to reconsider policy questions that they would not likely discuss otherwise.

2. *Historians*, like their social scientist colleagues, *are also torn between inescapable tensions.* For example the tension *between the various worlds in which they have to live* – between past and present, not to mention future, and between divergent social and cultural worlds – and by the impossibility but necessity to (imperfectly) translate one world into another. More generally, they are torn *between complexity and simplification* (even if historians tend to prefer complexity and often have difficulties paring down simple narratives), *between description and norms* (something which becomes particularly acute when working for an institution like the Science and Society Directorate), *between romanticizing and indifference*, between empathy for 'actors' and adoption of a critical stance (a particularly susceptible facet when comparing academic science with patient knowledge and popular epidemiology), and finally *between the obviousness of words and their opacity, their multiple meanings* (a collective reading of the questions making up the Eurobarometer during the meeting showed this with utmost clarity).

3. *More importantly, social scientists and historians are always part of power games, notably games of legitimisation*. Since the world is not a harmonious whole that can be optimised, historical narratives, as for every social science production, cannot but give credibility to certain people and interests at the detriment of others. The choice of the most basic categories is central to any historical narrative, as is the list of actors that could be mobilized, the time frames that are used for comparison. Following actors might be a good starting point, but the list of actors is not a given. It is the analyst who, depending on the spatial, social and temporal frame delimited, *de facto* decides from an infinite list who is pertinent for their narrative. It is the analyst who makes the case for some actors against others, who forgets some and speaks (too much) of or for others. A major difference could be made in the lesson we might draw

from a story, for example, by simply 'inviting' some more people, groups or actors to the table, by proposing new connections, by defining new ontologies or by mobilizing other ways of reasoning and other disciplines. 'Tell me what your frame is,' says the invented proverb, 'and I will tell you what you will claim and who might benefit from it.'

4. This is well known. The reason it needs to be repeated is that *analysts and actors* – policy makers as well as historians or sociologists – *cannot but (at least partly) forget when in the midst of action.* When working as policy maker, when working as historian or sociologist trying to analyse situations, one cannot prevent being 'taken in' by their stories and one cannot but believe in the schemes they try to build and implement (although this is probably a good sign, a sign of conviction, for example). There is no universal solution to solve this tension, to resolve the 'contradiction' between knowing one's limits *in principle* on the one hand, partially forgetting them when arguing for a case on the other. There are only very pedestrian ways of coping with that tension: by deliberately conceiving plans or devices to alternate angles of vision from one frame to the next, or by involving more people in the conversation, notably people from other corners of the world and from other corners of the social and intellectual planets. Historians, with their own idiosyncrasies, might be further useful if they were invited to a table where they have not been very present.

5. The meeting also drew attention to *the complex relations between history, memory and institutions* since it might be that (today's?) institutions main function (or desire?) might be to destroy (certain) memories, to disconnect certain people from their (traditional? local? institutional?) ways of making sense of the world. Major institutions (what about the EU as an institution of power?) tend to claim that changes are such in contemporary economy that most accumulated knowledge, as well as much traditional wisdom and much (popular?) heritage, is becoming quite worthless. They tend to claim that adaptation to novelty, notably to knowledge society (definitely a new thing), to risk society (definitely a new situation our ancestors never really faced), to globalisation and so forth, requires drastically forgetting what we learned in the past – and learning to live only in the present situation. This is not an 'academic' question. It is a question with immediate consequences, for example in terms of identities and of the capability for many people to 'remain in the world'.

6. Finally, we stress *the difficulty of passing from 'is' statements to 'ought' statements*. This is easy to understand as soon as it is realized that 'win-win' situations are not common and that the 'common good' from which to build normative discourse is at the core of public dispute. In addition, explicit normative statements are not common among historians working on their own. They tend to ignore the question because they rarely *have to* translate their narratives into 'ought' statements. During the workshop, the general feeling was that 'ought' statements are not derived from (historical) narratives and that they are what is at issue among people and groups, cultures and nations – and so among historians themselves. Historians (qua historians) spontaneously tend to believe that their function is to render the various normative frames present in each situation explicit. They also tend to analyse the way the normative postures they describe are linked to larger situations, but rarely consider it their duty to intervene in the debate itself. On the other hand, it is not as rare to see them taking sides. As such, historians are often good at implicit, non-assumed, normativity.

7. Following this lengthy introduction, what can history contribute? What can historical oriented approaches do and not do? How can historians help in understanding the present and its changes? How can they intervene in policy matters?

A common feeling during the workshop has been that historians could be of help even if, as previously stated, there is no intrinsic 'disciplinary' necessity. *De facto*, the discussion as it

evolved over the two days led to a number of conclusions, namely that historians might be of help:

* *In instilling doubts* about the way situations are commonly described and policies are argued for, in multiplying narratives, in restating complexity, in showing the messiness of the present and in undermining policies based on too simple assumptions.

* *In being attentive to the legitimating roles that grand narratives play in the social body* (social history of science and cultural studies are now accustomed to charting how ordinary narratives are used to define and argue for certain choices and values as opposed to others). An example is the presently popular story, that a former bureaucratic state power working with unaccountable experts has been recently matched (and progressively replaced) by the growth of an ever more active bottom-up civil society able to get at a consensus.

* *In charting the rise to power of grand narratives by deconstructing them -- and so helping alternative narratives to emerge*. If one realises that policy proposals implicitly rely on certain ways of putting the present in historical perspective (that explain what went wrong and what should be changed), it becomes important to elucidate the blind spots and help other readings to emerge.

* *In using historical cases as heuristic tools to revisit contemporary questions* and as 'thought-experiments' where possible imperfect precedents might contribute to detecting new options for the present.

* More ambitiously, *in indicating possible or likely consequences of a policy* by relying on what could be called *Retrospective Policy Assessments*. For example one could try to compare the systemic effects of different ways of regulating techno-scientific products. This is something historians could do since, in part, they know the 'end of the story' and the effects each regulatory mode tends to have. This works only through analogy but it might be intellectually stimulating if we suppose that institutions have a kind of 'natural slope' which often leads them to specific solutions and results – that they have a kind of historical inertia.

8. Some conclusions, which might be of help for policy terms, could thus be:

* The ways of reading the world are numerous and 'interested' and policies should be wary of grand narratives, notably with frames that do not *explicitly* envisage alternatives or with solutions that appear as quasi-universal.

* There are no ready-made solutions to problems. Contradictions and interests are part of the world; they are numerous and imagining solutions requires navigating between principles and pragmatism.

* The heuristic of historical studies is not the panacea but if cleverly handled, it might lead to useful critical vision – and to changes.

Annex 3

Proceedings of the workshop, as well as of the preparation for and the context of the workshop

1. The objectives of the meeting

1.1. On 29-30 June 2006, the Directorate Science and Society of the European Commission's Research DG organised a workshop entitled "*Historical perspective on science and politics*". The general purpose of the workshop was

"to tackle the questions of the interrelationships of science and politics through various historical situations in order to enrich today's debates on science and society issues, the final aim being to give input to policy making at EU level about *science and/in society*"

1.2. A preparatory document issued by the Directorate gave the following precisions:

"We need the historical perspective to help us deal with the clichés. And also to consolidate the path between scientism and obscurantism. Indeed, often the policy-debate is permeated by these two extreme positions, and it is not so easy to stay away from these two postures.

History, as a discipline, is key in *challenging our imaginaries of the past*. Indeed, in policy-making, I would claim that there are *two reflexes*, about the past:

"*Amnesia*": Claiming that we are facing "new" situations, that things are changing fast, etc, This rhetoric disqualifies history and tends to magnify the challenge and the responsibility of decision makers, as if they were faced with a white board. It aims at giving prestige to agency and those in responsibility.

"*Golden age references*", which have some link with the past and "vraisemblance", but which can be hugely selective and misleading. For example, the idea that there is a time where people trusted science fully, or were more "excited" by it or "curious" about it, or where things were simpler, or better.

To put it simply, we would expect from the seminar to help us *dissolve a little bit these two reflexes*, so that we increase our collective self-awareness about what is *really* new, and what is not. What is open for choices, how we can make use from the experience of our parents, grand parents and ancestors, in a more mature way? The seminar should help us see the limitations of these two reflexes, in order to *increase the margin of manoeuvre for EU "science and society" policy-making*."

1.3. The outcomes of the workshop were to be of two kinds:

First, the writing of a *Research agenda* consisting of a set of research proposals in history of science, technology and medicine allowing the Science and Society Directorate to open such a

research program in the 7th Framework programme.

Second, a set of *direct messages* to be sent to the Science and Society Directorate that might help them to look at their programs and policies with new eyes.

2. What was done? The workshop and its organisation

2.1. Dominique Pestre, directeur de recherche (professor) at EHESS, was to ensure the scientific conception and preparation of the workshop and to write a final report. After having accepted the task, he had a series of preliminary discussions with Wolfgang Krohn and Peter Weingart in Bielefeld, Christophe Bonneuil and Jean-Paul Gaudillière in Paris, Peter Galison and Simon Schaffer in Cambridge, United Kingdom.

2.2. Peter Galison, Jean-Paul Gaudillière and Simon Schaffer agreed to join him in organizing the workshop. In a letter to the 40 participants, they defined the project as follows:

"This workshop is intended as an open and exploratory discussion seminar, without too specific an agenda [...] The workshop will map the domain « Science and Politics » (or « Science and the Political ») as it stands today. This two-day seminar will consider, in part through historical analyses, how we currently frame questions in that field, the main hypotheses we would like to work with in the future, the research programmes that could be opened up for further inquiry. Most of the time will be spent discussing and thinking […].

To participate in the workshop [... you need] to write a short piece of around 700 words about your perception of the question and what you would consider essential to be tackled during the meeting. The precise organization of the meeting will be decided after receipt of these short pieces […]

In more global terms, we would like the participants in the workshop not to limit themselves to descriptive approaches, but to be bold in attempting to elaborate their reflections in more theoretical and normative terms. Neither historical nor anthropological work can easily teach lessons in isolation. Rather, the interests of these disciplines, if properly addressed, is to function as kinds of laboratory experiments to aid the constructive imagination of other arrangements than those before our eyes. Thus in more normative terms, our invitation might perhaps include an attempt to envisage the exotic yet feasible equivalent of an ideal public sphere for knowledge production, appropriation and regulation."

2.3. There were to be no limits imposed on the topics to be discussed. The organizers, however, considered it useful to propose a first set of potential questions. The questions were outlined around three main poles and communicated to the participants:

(a) *production*: How can we describe the production of knowledge in society? How and where is knowledge produced? Who produces interesting knowledge, how and why?

(b) *restriction*: How do we describe the various forms of its appropriation? How is access to knowledge distributed or controlled? Who makes knowledge accessible to whom, who restricts the access to it and how?

(c) *regulation*: How do we describe the various regulations of knowledge by the social body? How is knowledge evaluated, how and by whom are its consequences measured? What means come to be used in each social context to arbitrate between interests? Who arbitrates

the terms of trade?"

In addition to these three themes, a fourth was also to figure prominently:

"*the reconfiguration of the political sphere:* How in recent decades politics was redefined from below through new forms of political action and from above through new forms of governmentality and management?"

2.4. After receiving texts written by the participants, the proceedings of the workshop were established. For the first day, it was suggested to maintain the idea of a general discussion without too much worry about 'research agenda' and 'direct messages'. This was thought to be a necessary stage in order to cover as large a field of preoccupations and questions as possible. Four sessions were planned for the first day: (1) Consider past and present linkages between patients, customers and activists; (2) Consider past and present linkages between scientists, citizens and managers; (3) Consider past and present linkages between production, restriction and regulation; (4) Consider how to write a history of the present.

The second day was to be slightly different. In the morning, the idea was to have brainstorming sessions around three notions common to EU publications, Science Studies and STS literature. The three notions were: *Knowledge Society*, *Risk Society* and *Globalisation*. In the afternoon, two plenary sessions were organized. The first on the ideal *research programme* and the ingredients participants defined as essential. The second on the more *direct messages* the participants thought should be conveyed to the Directorate.

3. Summary of the workshop discussions

What follows is a selection of remarks from the workshop discussions that were not used in the body of the report.

3.1. Session 1: Consumers, patients, and activists

We began by considering what falls under the labels *technical democracy* and *dialogic and participatory procedures* – from environmental activism to consensus conferences. We stressed the huge variety of situations, the variety of meanings given to 'participation' by actors historically, the (normative democratic) interest of participatory procedures and also their limits. We called attention to the organic and inevitable tension between participation as an instrument of government and participation as a way for ordinary actors ('civil society') to seize problems for themselves.

We asked for finer descriptions of practices and discourses and for finer descriptions of the figures of the consumer (of high-tech products and medicine), of the client and of the patient. We considered the agency of people when dealing with techno-scientific products and its variety.

The remarks concerning apparent changes could be presented as follows:

* There seem to be changes in the capacity of biomedicine, pharmacology and surgical to collectively reorder the cyborg we are or are entitled to be.
* There seem to be changes in publicity: consumerism, advertisement, auto-medication and direct appeal to patients as consumers. But there also seems to be a new stress on the individual, their experience, their biography, their public theatrical *mise en scène*, their insistence on their right to a performing body, to health and personal re-programming and on

their right to a performing body, to health and personal re-programming and on their right to optimise their life and performances.
* There seem to be changes in parts of the public sphere and in the media: discussions, chats and exchange of experience appear as key ways to knowledge; one's experience is valorised – on such issues as how to deal with by-effects of products, how to get the drug one wants, how to hack on clinicians, etc.
* There seem to be changes in identity politics, that is in the way people identify themselves publicly. There seem to be changes in the penetration of the public sphere by the personal, private, bodily dimension. There seem to be changes in the making of social aggregates, in the right to choose with whom to form a bloc and act politically.

The latter might be at the core of consumer, patient or environmental activism, where the point is perhaps less to become an expert than to become one's own master and to become the intelligent, ideal consumer / patient / citizen / subject / activist.

3.2. Session 2: Science, citizens, and managers

We first considered the government of science, technology and innovation, notably the governing of university, and the consequences in the production of knowledge by scientists (including social scientists). We thought the question should return to the general trend of audit society.

We discussed the scientific tools of government, from the Cold War and the heydays of Keynesianism to the present. We considered the combination of tools and disciplines that now defines ‘good knowledge’ and the particular mix of economics, mathematics and management that is now as the core of the governance of knowledge, a core which defines what is deemed as efficiency and productivity, and that is itself above accountability.

We considered the institutions in charge of this government from the think tanks of the 1970s and 1980s (that redefined proper knowledge in economical, political and social matter) to WTO or the World Bank now. The fact that universities are no longer alone, or perhaps as the main institutions that define proper knowledge in the social sciences, is of major importance.

We thought that the North/South order deserves particular study. International institutions transformed universities in the South, such that many of them are now contract-based, with few tenured positions, and research is done on stricter time-span and on explicit cost-benefit analysis. An international class of interchangeable (local and global) experts has been built (independent of the universities) by international organisations. This group, in parallel to the class of international business managers and consultants and the class of international organisation people, form the new governance of the South.

Two other points were also considered: (1) The fact that markets have not just replaced states in world management. (2) Today governance is a reflexive and subtle form of government. That is, a form attentive to the subjects and particularly to words, outformation (the word is Ezrahi) and the theatre of media.

3.3. Session 3: Production, restriction, regulation

We began by revisiting a well-known set of questions, that of the variety of the social spaces in which ‘knowledge’ is produced (from amateurs, users, non-proprietary to industry, military, think tanks and university set-ups); that of the interest in describing in which way

tary, think tanks and university set-ups); that of the interest in describing in which way these sites lead to 'different' knowledge (high-energy physics *vs.* indigenous knowledge); and also that of the intense traffic between them (contrary to the dominant official scientific discourse).

We considered the various forms of control on other people's knowledge and the role of usages. We discussed the parallel/competing/alternative modes of regulating technoscience that are in use. We also considered the fact that the production of convergence by central institutions is matched by a concomitant production of divergence, the production of controls by the return of new heterogeneity and the production of new orders by new forms of deviance.
An epistemological remark was made about the title of this section: why use these three categories when all production of knowledge (which is a social activity) is necessarily a form of control, a form of restriction and a way of regulating knowledge and people. Similarly regulating boilers in the mid-19th century, or regulating biodiversity today, are an efficient way to produce new knowledge. That is certain, but stressing restriction and regulation in parallel to production meant studying these activities as specific ones and it meant inducing comparisons at that specific level.

3.4. Session 4: History of the Present

This session began with an overall feeling of uncertainty and of difficulty in predicting what was to come next, and that this feeling might be constitutive of the present situation. Its roots might be in the blurring of the political game (nationally, regionally and internationally), in the dilution of the democratic representative hierarchical order, in what techno-science has to offer (through bio-technology and medicine), but also perhaps in deliberate attitudes to try to increase uncertainty.

Several narratives were tried. By comparing 1960 and 2000 for example, oppositions could be proposed between 'dominant' (techno-) scientific activities, such as physics *vs*. biomedicine, particles *vs*. clones, large unique telescopes *vs*. distributed sequencing machines, laboratory *vs*. field, humanities *vs*. management. Criticisms of this kind of dichotomy were raised. They might just reflect the media surface of things and thereby forget other key activities (chemistry, mechanical engineering and normal 'pharmacy'). History should thus be written across domains.

Another series of contrasts was tried; such as producer and managers (central in the economic order of the 1960s) *vs.* consumers and shareholders; aristocratic science and top-down hierarchies *vs*. distributed knowledge and techno-business successes; science as high culture *vs*. science as political economy. Criticisms of these contrasts could be that they mask the importance of the production process; that consumption has always been the main regulatory mode, whereas what has changed might be *who* the consumers are.

A third narrative contrasts networks and the multiplicity of intermediaries against disciplinary and integrated systems; private *vs*. public (in terms of IPR, for example); research firms *vs*. university; NGOs and international frames (WB) *vs*. national states; scientific method *vs*. ethics (as a tool of government); the manufacturing of fragility and uncertainty *vs*. that of certainty, which may trace a move from national politics to distributed and more opaque governance.

A fourth narrative put the North/South relations on the centre stage, with today's regime of transnational traffic at all levels (products, finance, knowledge, culture, people, body parts)

vs. bloc to bloc Cold War politics; long list of actors defining the rules and acting *vs*. state / industry centred activity; global techno-scientific production and commodification *vs*. necessary national catch-up by steps (in terms of development). Taking the South as a starting point has the advantage of stressing the non-unity of the regimes in which we live and of forcing us to think in terms of *juxtaposition* of regimes. Colonial India, for example, where British rule was central in the regulation of economy, but not in many aspects of social life. This could help introduce temporality and contingencies more systematically in our narratives.

The question was posed of the different chronologies we use. The most obvious contrast is with the Cold War period and science. The Cold War is marked by strict dichotomies at all levels (from the political to scientific disciplines), by reassuring stabilities (high energy physics was to exist for ever and remain the fundamental discipline), by clear symmetrical identities (the ontology of the enemy was our mirror image) and by universal values (purity and unity were thought possible in science as in the arts). Recently, this Manichean world has evaporated. Constant adaptation, flexibility and over-valorisation of the present have replaced a world of slow social change and of eschatology. More recently, since the year 2000, the enemy has reappeared – but the enemy is described (in the North) as omnipresent and incomprehensible – not our mirror image!

Other chronologies were tried. We mentioned longer time periods and considered 1870-1970 as a moment in which the 'social question' was the ordering principle of politics. Symmetrically, one could suggest shorter chronologies. Chronologies should also be built from the point of view of Eastern Europe or former colonies, which would lead to other master narratives and questions.

Finally the question was raised if our own approaches are not still moulded in the kind of Cold War dichotomous world. We wondered if this was adapted to enable discourse about the present.

3.5. Working group on 'Risk society'

The working group first stressed that its aim was to consider the notion of 'risk society' and not that of 'risk.' This is not to say that a link could not be made between them, or that it would not be interesting to do so. The point was simply that the notion of Risk Society has a life of its own, which is non reducible to the various meanings inherent in 'danger' or 'risk' in the past and the present.

The group drew attention to the fact that there are many connotations associated to the expression 'risk society' – and that its interest is precisely to be polysemic. If the expression has become so ubiquitous, it is partly because 'risk society' is a way for different experiences of the world to be given a common expression. Among these connotations are that we live in a more dangerous, techno-industrial world, but more importantly that we live in a brand new world that goes on (even if at some costs) and that has learned the recipe to master progress (our development is sustainable). 'Risk' is what remains in that political economy of normal progress, a mere situation we have to face, that is not a matter of choice. Victims (of asbestos for example) might think otherwise, but they are not in a position to define what the truth and the right vocabulary are. What the expression 'risk society' tells is that 'risk' is a kind of 'natural' thing that all experts and institutions seriously try to reduce – not a way of discursively framing (and masking) our relation to social and economic development.

The group thought that a genealogy of the notion, a narrative of its emergence, and of its rise to familiarity, would constitute an interesting research program. Without claiming any precision or exhaustivity the group mentioned : key authors (Jonas or Beck) and notions (responsibility, global risk); the way they evolved to mean other things (with Giddens for example); changing social and political situations (rise of the green parties in the 1970s, multiplicity of accidents becoming 'affairs'); changes in governmentality (setting up of new regulatory bodies in the 1970s in the United States, but bodies that were contested in the 1980s or 1990s by more right-wing groups); the fact that 'risk society' became a managerial tool in the late 1980s; changes in the conception of health, of illness and of the ideal body (there are now 'people at risk'); changes in social values and behaviours (ban of smoking); in individual responsibility in predestination (risks associated to genes) and in welfare. In short, risk society is also a symptom of, and a way of creating, a social reality that avoid what had been the political question par excellence – where do we want to go as a collective and what is the part of innovation in that process?

3.6. Working group on 'Knowledge Society'

(Without repeating what has already been said. For example on the polysemy of the slogan or the importance of building genealogies.)

The working group first considered the words being used. Why *knowledge?* The question was asked as other words were in more common use before, such as industrial, post-industrial, technological, innovation, information society. Why knowledge and not scientific or research societies? Why *society* and not *economy* or *management?* Why consider that we are in knowledge societies – and that the Cold War and imperial Germany were not? What if we consider how notions are linked to opposites: such as industrial *vs*. agricultural society; or information *vs*. industrial society? And knowledge *vs*. information society? Or *vs*. ignorance? Discussing each aspect led to a discussion of the wide range of connotations the expression could take in different contexts.

The group stressed that the expression also seems to give new clothes to old notions. It lets people believe in a linear model of development (from knowledge to economic success) and in the idea that 'grey matter' (an older notion that has disappeared) remains the core of progress -- as opposed to crafts or organizational skills for example. It implies that we can be confident in the future (knowledge is progress *par excellence*). The expression also helps to avoid talking about certain questions, like ownership of knowledge; or the 'fair' relation to be established between public and private.

On the other hand, advantages could be drawn from the expression. We might ask its promoters to take it at face value and to consider it seriously; to consider that knowledge is distributed, for example; that it varies in kind; or that knowledge is more than science. In this act, we could help reframe the notion, enrich its potential meanings, change social meanings -- and draw conclusions for policy.

3.7. Working group on 'Globalisation'

The group raised a question the other groups had not posed: *Do we believe or do we not believe in the phenomenon the expression is intended to describe?* This difference might be without meaning (beyond the mere composition of the groups). It might also mean that expressions like 'we are in knowledge / risk societies' function more as slogans to mobilize

people that the third (perhaps more descriptive) expression.

What also came out of the discussion in this group are the links with previous situations, like colonialism and imperial powers, and *the links with the old stories of geopolitics of trade and exploitation*. This led to reconsidering previous forms of globalisation. The forms initiated by the 'discovery' and European control over (and destruction of?) the new world(s) in 16th century; by the inventories of the natural resources by European companies and states in 18th or 19th centuries; and by globalisation as a practice of transfer and appropriation of people, plants, products and indigenous knowledge. We raised the question: What would produce a precise comparison between Kew garden as an institution, a network, a type of knowledge and the World Bank today? Or between Humboldt and Mercks in Latin America, and in their relations with local populations?

The many associations with the word *global* were considered. Global evokes a planetary consciousness and phenomenon ('a world economy', 'the terrestrial environment'); new global institutions and new roles for knowledge; other forms of internationalisation and diplomatic order; other ways of sharing values and modes of action (from trade unions to alter-movements); other ways for those in power to promote their (national or economic) interest; other ways to cast citizenship, etc.

In short, the three expressions seem to be at the root of a new master narrative and of a new way of looking at the world, but also of developing it and of reorganising it anew. Paradoxically, they might be symptoms of a world that cannot exist without a constant flow of new (global) experts, such as scientists identifying the risks we face and mobilizing their knowledge to cope with them (global warming and Kyoto protocol for example). But also a world that can no longer be controlled by ordinary people and institutions as it is too big, too large and too diverse. Citizens could enter the scene and elections could go on, but only 'global institutions' articulating 'global knowledge' and mobilizing 'global capabilities of action' through 'global governance' could really do the job. From this we might perceive the now central importance given to economics-and-management in the concert of the most important knowledge. Its function is to properly mobilize, when and where needed, all other *local* ways of knowing – local in the sense that they do not allow for the good governance of the global -- such as Science, meaning here all the 'hard sciences', but also social sciences like anthropology. In this sense, it might well be that the world has profoundly changed.

Annex 4

Texts received from the participants to the workshop

Jon Agar

(a) Production

How can we describe the production of knowledge in society? How and where is knowledge produced? Who produces interesting knowledge, how and why?

Government financed research and development ranges between 0.5% and 0.8% of European countries' GDP. On the other hand R&D financed by business is roughly three times as much.[1] If you take just one country, the UK, the dominance of business in performing research is also clear. The UK in 2003 (the last year for which we have accurate figures) spent about 20 billion pounds on research, 45% of which came from business. If we look at where the money was spent (rather than where the money came from) then business accounts for over 13 billion pounds. In other words, business does nearly three quarters of the research and development in the UK.

Furthermore, much of the research was done by small to medium sized businesses.[2] If we want to know about contemporary knowledge production then we need the historical and sociological tools and projects that will open up the small science-based business to scrutiny.

Of course spending money on research and development is not the same as the production of knowledge, and certainly not the production of interesting knowledge. I personally, for example, think that the amateur natural historical networks that produce highly localised knowledge about species fluctuations, knowledge which is then used as evidence in planning or pollution controversies, provides interesting case work for the sociologist/historian. The amount of money spent by such networks is almost negligible. Nevertheless, I think there are good reasons for sociologists/historians to "follow the money".

(b) Restriction

How do we describe the various forms of its appropriation? How is access to knowledge distributed or controlled? Who makes knowledge accessible to whom, who restricts the access to it and how?

(c) Regulation

How do we describe the various regulations of knowledge by the social body?

[1] UK Office of Science and Technology, SET statistics. Trends in government financed GERD in G7 countries as a percentage of GDP, and Trends in business enterprise R&D expenditure in G7 countries as a percentage of GDP, 1994-2003.

[2] Probably! The statistics here are tricky to pin down. It is certainly the case in key sectors such as biotech.

How is knowledge evaluated, how and by whom are its consequences measured? What means come to be used in each social context to arbitrate between interests? Who arbitrates the terms of trade?

I will consider these two sets of questions together. The following is a record of some observations made during research I co-managed as part of the Royal Society of Arts' recent project, Forum for Technology, Citizens and the Market.[3]

In our research we found many of the effects that one would expect concerning commercial science. Science-based companies are profit-driven. The most powerful factor shaping decisions on research programmes is the bottom line, with consequences for commercial secrecy surrounding research. Companies behaved as we expected companies to behave. Companies were understandably reluctant to invest in public engagement activities that did not contribute positively to the balance sheet. (And here one Science and Society research programme that the EU could activate immediately follows: sponsor a public engagement programme that demonstrates both that a company can benefit and that shows a clear positive influence by citizens on the research programme, and engagement will be much easier to "sell" to companies.) At present, the result is that companies invest in limited means of preserving reputation (PR, CSR), and a democratic deficit for European citizens with respect to science.

Market considerations shape distribution and control of knowledge. But some consequences for the public access of knowledge, and therefore the extent to which knowledge can be evaluated, used, commented upon, opposed or supported by the social body, stem from the way science-based companies relate to each other. Examples of single companies containing the whole complex process from research to a product that is consumed by the public are rare. Typically, science-based companies are linked together in chains or networks. So one company might contract out research, testing, metrological services or development to further companies. This same company might sell on its product to other companies that finally assemble a product the public might encounter.

Given this picture, consider what might happen when "upstream" public engagement is attempted.[4] Where companies are in partnerships, or chains, no company often knows whether it "owns" the responsibility to engage with public concerns. In the absence of certainty, there is a chilling effect: nothing is done because it is not clear who should be doing it. A related effect was observed in companies that do not sell direct to the public (and, as I have argued, most scientists in Europe will probably be found in such companies). Here there is the assumption that responsibility is transferred down the chain to the companies that deal directly with the public as consumers. But the companies that face the consumer probably do not do much research, so they too do not assume the responsibility of engaging with the public.

We found that companies have a great variety of informal ways of engaging with the public but very little awareness of the more formal means – consensus conferences, citizens' juries, etc - proposed by sociologists and think tanks. Even "GM Nation", a highly publicised, if deeply flawed, consultation on genetic modification staged by the UK government in 2003, was not well known.

We also asked companies if they had found their technical products used by users in unexpected ways. We received very few adequate answers. Quite possibly companies were

[3] Royal Society of Arts, *What's There to Talk About? Public Engagement by Science-based Companies in the United Kingdom*, 2004.

[4] Rebecca Willis, James Wilsdon, *See-through Science: Why Public Engagement Needs to Move Upstream*, Demos, 2004.

reluctant to discuss such instances for legal reasons, although none volunteered this explanation. Nevertheless, the result was surprising given the insights of the recent turn to active users in the sociology of technology. It barely needs to be stated that the companies were unaware of such scholarly work.

In summary, the structure of how science-based companies relate to each other, in addition to familiar features of commercial science, create severe problems for increasing citizens' influence on research programmes. In addition, current high profile EU projects of direct relevance to the regulation of science-based companies do not 'face' EU citizens (as an experiment I recommend a browse of the REACH website on chemical regulation).[5] Furthermore, sociologists and historians have been ineffective in pitching their work so that such influence can be understood, discussed, criticised or supported. Sociologists and historians who take public money should earn their keep and contribute to the public debate. Public engagement provides fora where they can and should operate.

Daniel Alexandrov

Here I make three main points: first, on the relation between history of science, policy research and the economics of science; second, on the effect of disciplines on science policy, and, third, on the historical trends in the sociability of the sciences.

Science Studies: Challenge of Politics or Economics?

So far in the last twenty years the most innovative part of research on science and science policy was the area of science studies or SSK in which the history of science blended with the sociology of science and the sociology of knowledge. The economics never entered the new alliance simply because there was no interesting economics of science to speak of in the 1970s and 1980s. This is no longer the case.

With new institutional economics in full bloom around us, the questions on production, restriction, regulation of knowledge posed by the organizers seem to be about economics rather then politics. At least, one has to consider both institutional economics and institutional political theory to answer these questions. May be we have to redefine the problem of science and politics as a problem of political economy of knowledge and view it through institutional optics.

The history of science has to take up a challenge of new institutional economics, evolutionary economics and organization analysis. In fact, new institutional economics of science developed by Paul A. David is based on the new history of science – suffice it to mention that in David's articles there are more references to historians of science than to the economists. The corner stone of evolutionary economics as developed by Roger Nelson and Sidney Winter is the concept of 'tacit knowledge' and organizational routines – these concepts seem to be 'boundary objects' allowing for fruitful interaction between history of science and new economics. Moreover, new economics and organization analysis widely use history in the form of 'case studies evidence'.

[5] http://ecb.jrc.it/REACH/. 'A proposal on a new EU regulatory framework for Registration, Evaluation and Authorisation of CHemicals (REACH) was adopted 29 October 2003. REACH aims to improve the protection of human health and the environment while maintaining the competitiveness and enhancing the innovative capability of the EU chemicals industry.'

In fact, the production of case studies is main current mode of doing history of science. History of science and science studies turned to micro-analysis abandoning grand narratives of history of ideas or science in broad strokes. Unfortunately, but quite naturally in the sense of generational dynamics, science studies also abandoned large-scale comparative studies, Ben-David style. It seems though that time has come to do comparative research. If we are to influence the economics of science and science policy we have to present the multiplicity of our micro-historical research in a well organized comparative perspective through conferences and collective volumes.

Science Studies: Disciplinary Trap

Most important is cross-disciplinary comparison. Science studies inadvertently fell into the trap of disciplinary structure of science – the most notable exception was the emergence of laboratory studies and recently the attempt to establish the area of field studies and explore the very boundary between laboratory work and field work. Most of innovative and important studies of field research were still disciplinary bound, and were viewed as such – history of geology, history of plan ecology etc.

Discipline structure of science is an institutional trap which is influencing research policy and science funding all around the world. Though agencies may fund now "interdisciplinary" areas instead of old disciplines, sciences are still viewed by governments and funding agencies through the lens of university structure. One of the important tasks historians can take on themselves is to show historical changes in and contingencies of disciplinary structure of science.

Moreover, in order to understand the relations of the sciences and the societies and produce viable research policy one has to reconsider the structure of science and scientific disciplines altogether. The distinction between 'laboratory sciences' and 'field sciences' cuts through biology and divides it in two parts, one to side with chemistry and other to side with social anthropology and geology. The study of material culture of physics showed the difference between science, built around large-scale technologies, and science, built around small laboratory paraphernalia. These historical studies, taken together with the pragmatic turn in science studies and new institutional analysis provide us with both empirical evidence and analytical tools to produce a new classification of the sciences and scientific practices for the use in research policy and funding.

We know it from literature, but one has to show clearly and carefully that 'big sciences' with large scale technologies, the sciences of laboratory bench, and field sciences have different social organization and different modes of knowledge production. There are insights into institutional organization of science to be gained in making cross-disciplinary comparisons. For example, while laboratory science of biotechnology, new computer sciences and field-oriented environmental sciences differ greatly in theoretical approaches, disciplinary traditions and research practices, they have much in common in social and economic dynamics. These sciences 'interface' with the society through the web of small organizations: large and small NGOs in the environmental studies have the same social function as large and small commercial firms in biotechnology.

Modes of Production/Sociability: Coming back to the Eighteenth-century?

Students of science like many people think that their present is the beginning of a new historical period, in case of science it is a new period with new modes of production of knowledge and new modes of sociability of science. It might be true, but careful historical comparisons may alter this picture of ever changing science, which owes much to the

may alter this picture of ever changing science, which owes much to the seemingly abandoned good old progressivist vision of science.

Certain modes of knowledge production that emerged in history stay with us largely unchanged because they belong to certain forms of life around stable socio-technical systems and networks – for example, nuclear power and high-energy physics or chemical industry and chemistry. But they are 'in vogue' only for the limited period in history when they dominate state, commercial and public interests and our general vision of science. Fascination with physics was replaced by the interest in chemistry, and then again with physics, and now by biotechnology and environmental sciences. Big science stays with us but is no longer big in public eyes. In fact, societal shift from big concentrated industry/businesses toward medium and small distributed forms of economic life occurred in the twentieth century earlier than in science per se.

Modern biotechnology and environmental sciences are new, but are respective distributed modes of knowledge production as new as we tend to think of them? Mode 2 of knowledge production (Gibbon et al, 1994) may seem new in comparison with a Big Science, Cold War style, but is it new in a broader historical perspective? I will go as far as to claim that the general mode of sociability of science and scientists, in fact, return to the eighteenth-century models. What we see in environmental sciences is the emergence of new Kameralwissenschaften which along with the state have international organizations as their principals and/or patrons. World Bank or WWF plays Friedrich the Great, and the Earth Institute in Columbia University headed by economist Jeffrey Sachs is the modern reincarnation of cameral sciences.

I summarize my argument in the following table.

	XVIII – early XIX cc.	XIX-XX cc.	late XX-XXI c.
Area dominating public/state interests	Cameral sciences	Laboratory sciences	Environmental sciences
Knowledge	Territorial	Disciplinary / Universal	Local knowledge / Glocal perspective
Dominant mode of coordination	Networks (patronage, peer)	Hierarchical organizations	Networks – multiple
Answerability	Political	Relatively autonomous	Broad Social / Political
Relations between science, government and industry	Boundaries not yet constructed	Emergence and maintenance of firm symbolic boundaries	Blurred boundaries
Scientists' employment	All sectors – flexible	Academic	All sectors – flexible
Relations between sciences	Syncretism of natural and social sciences	Natural and social sciences divorced, maintenance of disciplinary boundaries	Synthesis of natural and social sciences, blurred boundaries

Peder Anker

The Ecological Sciences and Society

The relation between the ecological sciences and society reflects ongoing environmental debates, which, according to some, is a matter of survival. The professional ecologist expresses such worries in more mundane terms when analyzing pre- and post-germination determinants in the perennial herbs and the impact of hemiparasitic plant litter on decomposition, to mention two topics in one of the later issues of Journal of Ecology. To environmental think-tankers, ecology may signify something very different, namely a world-

tankers, ecology may signify something very different, namely a worldview in which humans must take moral responsibility as co-partners of the household of nature. To environmentally concerned citizens, ecology may simply imply buying products made of recyclable plastic or something as ordinary as a non-polluting shampoo. Clearly, ecological knowledge means very different things to various parts of society.

Despite the uncommon ground of ecological perspectives, there has been a shared call for better socio-political management of the environment. This general demand is what brought the diversity of ecological views together. Histories of the diversity of ecological reasoning are thus intrinsically linked with management of the natural world. Historians have untangled this relationship back to ancient times, though more recent histories of ecology have emphasised the importance of European colonial contexts. Key concepts and practices within the ecological sciences as we know them today first emerged as managerial tools for management of Empires. Many European ecologists training students of the 1970s had their own training and experience in trying to manage colonial environments to the benefit of their respective governments. The International Biological Programme (1964 - 1974), a forerunner of the equally influential Man and the Biosphere Programme (1972 -), may serve as an example of a programme led by past colonialists. There is thus an element of continuation from imperial management schemes in current ecological debates.

Yet much has also changed. New scientific patronage systems and ways of carrying out principles of ecology emerged in the United States during the Cold-War. As strange as it may sound, here the prospect of colonization of outer space became of significant importance with respect to ecological debate, methodology and practice. Research of the environment inside space cabins was important to the improvement of submarines and underground shelters, and it was in that context the ecological "carrying capacity" concept emerged. Ecologists involved in the space program of the 1960s aimed at constructing cabin ecological systems for spaceships that were subsequently used as models to understand Spaceship Earth. "All humanity is flying like spacewalking astronauts," the historian Michel Serres argued in his plea for making peace with "[t]he fastest shuttle. The most gigantic rocket. The greatest space ship [Earth]." He was only one of many environmentalists for whom space colonies came to represent the rational, orderly, and wisely managed contrast to the irrational, disorderly, and ill managed Earth. Human environmental and moral space was to be reordered according to the ideals of cabin ecology and the astronaut's life in outer space. When humans were understood in terms of astronauts, environmental ethics became an issue of trying to adopt the lifestyle of space travellers recalculating their material resources within a closed ecosystem. Space cabin technologies, such as computer simulation programs, sewage systems, air rinsing methodologies, energy saving devices, and solar cell panels, become regular ecological tools for biological survival, especially among landscape planners and ecologically minded architects. The rationalist and managerial ideals for measuring a spaceship's "carrying capacity" of astronauts also became a standard for organizing human practical as well as moral life onboard Spaceship Earth. This turn towards space ecology contributed to a managerial culture of scientific technocracy among environmentalists of the 1970s and beyond.

This short history of the relation between the ecological sciences and society may sound unfamiliar, as it contradicts established narratives of where and how environmentalism emerged. This raises the question of who have been the key agents in bringing environmentalism and ecology to the foreground of public debate. A history of ecological sciences which is intrinsically linked with public funding and management also raises the issue of whether or not the role of environmental organizations and activists have been given too much emphasis in our understanding of past and current environmentalisms.

Stuart Blume

The remarks that follow are based on more than 20 years investigation of the processes by which new health care technologies are conceived, elaborated, produced, evaluated and used (or not). Other than in most areas of science and technology, neither advancing knowledge alone, nor the profitability of innovations provide a socially adequate measure of achievement in the health field. How are scientific and technological advance reflected in the changing health statuses of individuals, social groups and populations – and in changing health inequalities? Despite more than a century of undoubted achievement, popular expectations of medical science and of medical practice are always somewhat ahead of what has actually been achieved. These expectations are cultivated by the profession, by scientists, by industry, and by the mass media. The imminent prospect of a new drug or test may generate a politically powerful demand, well before its efficacy has been demonstrated, leading to controversies that impinge on the assessment process. Over the past 30 years Health Technology Assessment (HTA) has developed increasingly sophisticated instruments for establishing the safety and (cost) effectiveness of new drugs and devices. Yet HTA practitioners – as bioethicists have recognised in their own case – may be unable to 'hold the line' in the face of politically powerful demands from both patients and suppliers.

Over the past half century, the processes by which new health care technologies move from the laboratory to the field have changed dramatically. Empirical research makes clear how inadequately concepts currently fashionable in the STS community – like "Mode 2" science – capture the multiplicity, the heterogeneity, or the consequences of these changes. What we see are changing configurations of institutions, of cognitive and social resources, and changes in the narratives that motivate and legitimate research and innovation…but changes that differ profoundly from one area to another. For example, the rights of patients (or health care consumers) to a greater say in the setting of research agendas, in assessing the benefits of new drugs and devices, in the policy decisions through which new technologies are approved for reimbursement, have become widely acknowledged over the past twenty years. A series of studies have thrown significant light on these processes. They have shown HIV/AIDS activists, breast cancer patients, and people suffering from neuromuscular diseases (myopathies) in particular deployed their own 'experiential knowledge' in gaining influence over research agendas and regulatory processes (in ways that differed from country to country). Other examples (eg from the fields of Alzheimer's disease or mental illnesses) could certainly be added. But the fact is that in much of Europe (let alone the developing world), patient organisation is patchy or non-existent, whilst the legitimacy of existing groups and the experiences and knowledge they contain are contested either from above or from below.

The development of vaccines against infectious diseases, once more a social and political priority, shows something different. The profound importance of scientific breakthroughs (e.g. new methods of virus cultivation in the late 1940s, new rDNA-based approaches to vaccine development in the late 1970s) is frequently stressed. Despite the difficulties (the recalcitrance of HIV/AIDS and malaria for example), optimism seems legitimated by past achievements. In this case the changes that have also occurred in the configurations of institutions involved in vaccine development, and in the social and cognitive resources available (and to whom), are less familiar. An example is the declining role of public sector vaccine institutions. As threats of 'global pandemics' are constantly held before us (SARS three years ago, avian flu today), the need for a global approach to public health and its technologies seems self-evident. Despite the variety of models now to be found, the need for global initiatives and globally orchestrated 'Public Private Partnerships' is rarely questioned. The rare exceptions are the few scholars studying their impact on national traditions, institutions, and public health policies.

The production of biomedical knowledge and the development and regulation of new and improved health care technologies are changing. Accounts of these changes, both popular and scholarly, largely conceal their uneven and complex nature. Notions like 'Mode 2', or (far more importantly) 'meta-analysis' (of clinical trial data), 'patient empowerment', or "a well coordinated global enterprise" (in the vaccine field), function both heuristically in focussing attention and, by the same token, divert attention. The task, surely, (as one historian put it) is to understand "the subterranean contours of contemporary discussion"

Christophe Bonneuil

Plants, Science, Politics, HSTS and the FP7 : some sketchy reflections

N.B.: history and social studies of science and technology will be here labelled as "HSTS" for sake of simplicity.

The sketchy following reflections stem from my work on the history of plant breeding from Mendel to genomics and on the GM crops controversy. I hope that examples taken from this area will raise some more general points on science in/and society issues, on how HSTS have framed them in the last years (at the crossroads of changing interpretive perspectives and changing policy demands) politics, and how FP7 may open avenues for other framings and other questions.

Plant breeding and genetics was until the early 20th century an undertaking dominated by private actors (farmers and breeding companies). In the framework of agricultural modernisation policies, the seed as input became a target of state public policy. So in the middle of the 20th century, public research[6] became not only a leading actor in the advance of plant genetics but also, in many countries, released varieties that were widely cultivated. As for the controlled clinical trial in biomedicine, the controlled agronomic variety trial (and the associated experimental and statistical knowledge) became the key metrological dispositive around which the governance of research and innovation was negociated between scientists, breeders, farmers' representatives and policymakers. Major achievements resulted from this period (strong increase in world cereal production), and a lot is still expected to feed the expected 9 billions in 2050. On the other side, the « centralized–delegatory innovation, genetically uniform-"wide spatial adaptation"-High input cultivars» breeding paradigm (linked with the culture of purity of late 19th-late 20th century genetics, being part of a wider quest for purity in western culture as well as in industrial rationalisation), has been criticized. This paradigm is increasingly held by some scientists, farmers and CSOs to be inadequate for low input systems and poor farmers (hence negative social and environmental impacts) and for managing genetic resources in a dynamic and fair manner. Around such issues (the environmental impacts of intensive farming systems, of access to genetic resources, of acknowledgement of indigenous people and farmers' knowledge and rights, and more recently with the GM crops controversy which I am also investigating), some new arenas and actors (small and organic farmers, consumers organisations, environmentalist CSOs, local authorities, courts) emerged, that were previously not part of the State-profession governance of research in the previous regime. Meanwhile, the experimental/statistical *dispositifs* for assessing varieties that were once a key element of state led regulation and standardisation have been i) eroded by the efforts of crop growers organisations and/or of corporate seed companies to develop more powerful *dispositifs* and ii) challenged by new modes of knowing and manipulating plants: biotechnology (the molecularisation and 'laboratorisation' of

[6] Universities or government agencies like USDA-ARS or INRA or colonial agricultural services…

breeding) and (to a much lesser extent) modelling. Public research institutions have retreated from the variety market in the last decades, a movement that was accompanied by the generalization of hybrid varieties in most crops and by major changes in the ways on mutualizing/appropriating knowledge and life (from Plant Breeders Rights on varieties to patents on genes).

The need for historically-grounded big pictures for understanding the present state of "science in/and society"

Actually, this story sounds both specific[7] and similar in several ways[8] to what happened in many other areas of science and technology in the last 150 years. I think these kind of transformations can better be accounted in term of three historically situated regimes of knowledge production, rather than binary categories like "mode 1/mode 2", confined-delegatory/open air-"hybrid forums" science or other fashionable concepts like "multiactor spaces", "triple helix" or "knowledge society". These regimes should not be self explanatory but should rather be seen as time and space contingent configurations articulating various modes of knowing, modes of regulating and modes of producing, and their characterisation needs empirical comparisons with what happens in others areas of technoscientific dynamics, and in different countries (I am thinking about works from Pestre, Pickstone, Marks, Cronon, Hughes, Jasanoff…). This more historically perspective may help to understand more sharply what is really new (because there are a lot of recent changes, I don't want to take the role of the historian seing nothing new) in the "knowledge society", in the interdisciplinary "mode 2", in the dynamics of risk and technology controversies, in the involvement of users and lay people, in the bottom-up approach[9], etc.

The need to think more reflexively about the various audiences of HSTS

Working on the history of plant genetics and on the GM risks controversy led me, beyond the domain of HSTS I was trained in, to collaborate and exchange with geneticists, farmers, CSO activists, seed industry breeders and policy makers. The diversity of what they are expecting from HSTS is very big and this may lead us to think more reflexively about our audiences and various social functions and their polarizing effect on the content of our work as well as the impact of our work on the "science in/and society" debate.

Although they often studied past controversies and not only contemporary ones, 1970's SSS were strongly political in the sense that they tended to open the 'black boxes' and 'boundaries' that ensured the authority of science. They were part of a wider empowerment of voices that criticized the way science reinforces and naturalizes the power of the technocratic "state" or/and of "capitalism" and/or of "male" and/or of "productivism". Then, part of this intellectual movement got institutionalised (which was a good thing even if some criticised the come back of a neo-internalism). It developed in university curricula, research programs, cross-fertilized with general history and history of technology and medicine; with various schools of sociologies; with innovation sociology and science policy studies, with anthropology, cultural, postcolonial women and literary studies, etc.

[7] the kinds of epistemic cultures in tension, the original UPOV mutualisation/appropriation system, the coproduction of epistemic objects with the transformations of agriculture, the variations of strategies and regulations from one crop to another, etc.

[8] the 3 periods, the rise and fall of the state as undertaker of industrial research and major regulator, the rise and fall of fordism, the rise of on-site tailor-made user-assisted innovation, the molecularization, etc.

[9] "Bottom-up" is now a leitmotiv in nanotech … but was already at work in plant breeders's early 20th century practices even if hidden behind the rhetorics of tailor-made planned innovation thanks to the science of mendelism!)

The constructivist toolbox has been a very funny and fruitful one as it was oriented toward opening up such a powerful institution as technoscience. This toolkit can (and has) actually be used to study many other objects: the market, the firm, the court, CSOs and their use of science, etc. I find worth considering seriously the idea from Michel Callon that, we as scholars should not ask the same questions when studying less powerful and emergent groups (he makes this case in particular to promote more empathical perspective and against asking too early some questions like 'representativity' of emergent concerned groups of asymmetry of power within them). So do we need to change our approaches according to our objects of investigation? This issue is also related to Haraway's notion of "intervention."

Policy makers, willing to smoothen the science-society relationship –to be short-, have also played an increasing role in funding HSTS research and polarizing its focus and questions: hence the development of research on the "public understanding of science", the lay perception of science technology and risk. More recently DG research and national bodies have stimulated researches (often optimistic or uncritical) on participatory processes of technical decision making, on the use of precaution and science in the discourse of various stakeholders, and on the interface between science, precaution and decision. But policy-makers tend to favour functionalist or prescriptive studies on the science-policy interface (telling what to do) rather than analytical ones (how it works).

To illustrate this trend in the "AgBiotech and society" area, one could note that French "GMO and society" related calls for project have till last year been framed along issue of public perception of science. Or I could talk lengthily my difficulties to get access 20 years old archives from the French competent authority and its GM advisory committee, although the same policy makers who refuse access ask me to give lectures in training sessions for civil servants of this committee to help them understand the controversy they are exposed to. But let's rather illustrate this trend at the EC level. Actually, in previous FPs very few empirical HSTS work has been supported on

-> empirical socio-historical surveys of the science-decision interface (details below can be skipped by impatient readers)

How experts of the GMO committee of EFSA (formerly Scientific Committee on Plants) are selected? What were their trajectories in the advisory arena –or other public arenas- in their country before and after being nominated ? How are they inserted in the scientific field of GM biosafety research and what kind of skills and assumptions are they bringing with them? How do different epistemic cultures (a molecular biologist does not see genes in the same way as a population biologist) interact in framing risks and benefits in the committee? How does their role as expert interacts with their research? How is an 'Opinion' collectively produced in practice? How are some problems defined as known by sound science rather than uncertain? How are some uncertainties deemed relevant from a regulatory perspective and others less relevant ? How do various stakeholders (industry, NGOs, farmers organisations, member states, etc.) intervene to influence the process and the framings? How are conflicts between national advisory bodies and EFSA, between the EC and member states competent authorities, settled? More generally, what are the stakes in the centralization of expertise and regulatory oversight (for the construction of European quasi-State, for the construction of the European market, for the construction of the European research area)? How did the European Commission solved the tension between the need to gather data supporting its 1999 moratorium for the recent WTO case and the need to legitimate the lifting of this moratorium? How are the boundaries of "confidential business information" and open science negociated in risk assessment? How are knowledge and norms also co-produced within and between OECD, WTO, FAO, other international bodies and treaties, patent offices ? Etc.

-> comprehensive studies on the development of plant sciences in Europe and in the world in the last decades, and the various cognitive, technical and social factors that are at play in this development (beyond a perspective limited to the 'visible' part of the GM controversy). (details below can be skipped by impatient readers)

Then one could try to analyse whether and how the GM controversy has modified the development of – public and private – research trajectory. Has the controversy been more than an epiphenomena from the perspective of the overall development of plant science, generating a few hundreds biosafety research articles and slightly accelerating the search for GM crops with GURT systems and no antibiotic resistance marker genes, whereas industry pull and the landscape of patents shaped much more strongly plant biotech and genomics patterns of development? If not, what are the reforms in EC science policy that might be useful if the aim is to give more voice to 'civil society' in science governance in Europe ? How has the controversy divided scientists and has it redistributed power within plant sciences? For instance, in plant protection research, have systemic/multigenic/horizontal research approaches received more attention than "one (or few) major gene" approaches? According to the lessons of the history/economics of innovation (lock-in problems, etc.) how far should the EC coexistence policy between GM, non GM and organic farming require also a wider plurality of EC-funded research and technology platforms to avoid some crops and low input farming systems being orphans of research (Callon, 1994)? Etc

Policy-makers' demand also tend to favour 'up to date' STS investigations rather than historically-informed HSTS perspectives considering the last two or three decades (which is probably the relevant scale for understanding the GM controversy), and showed (to my knowledge) few interest in the "longue durée" of Science in/and Society dynamics until this meeting.

A too narrow drift of HSTS research by policy demand[10] therefore involves some constraints on what are the relevant issues that may not only limit the production of a deeper picture, but also limit the relevance of our work for other societal actors, especially those who have no or few capacity to buy/steer academic research, including civil society organisation or the wider European public(s). The new FP7 shows a new will to support CSOs capacities to be partners research projects (as in Science Shops, in the Canadian CURA program of the French PICRI program) in all disciplines. So let us make the thought experiment that the DG research would ask patients organisations what they would like to see investigated by HSTS in the biomedical research system; open source communities what they would like to see investigated by HSTS on issues of intellectual properties, on knowledge public goods and on the efficiency of various models of innovation; workers unions confederation what they would like to see investigated by HSTS and foresight studies on the interface between the future of work and science and innovation policy in Europe; environmental NGO's what they would like to see investigated by HSTS on the ecological impacts of European research and innovation past and present policies or on the science-decision interface; what kind of indicators these organisations would like to be crafted and used in the governance of research, etc.

I don't mean that CSO-driven HSTS research's framing alone would be less narrow than policy-driven framing, or than scientists and communicators demand for science communication-relevant HSTS[11]. It might sometimes even favour conspiracy theory inclined studies and may not leave more space for longer time-scale studies. But a mix of these different HSTS users' demands, with a bit of peer-regulation, may complexify the ecology of HSTS knowledge production. This would both open new avenues in HSTS and help European

[10] It is of course legitimate for policy makers to ask social scientist to address questions whitch they consider relevant, and it is one of the social roles of social scientists to do so. And I am not denouncing any researcher for accepting such narrow framing since I have myself been funded by such national or EC projects.

[11] I don't speak here about industries since they have already a capacity to fund social science.

citizens and CSOs to have (a broader view of and) a stronger voice in the governance of the European research and innovation system.

Amy Dahan

Here are some reflections, based mostly on my knowledge of two areas I have worked on for the past years: 1) How the notions of chaos, disorder and complexity have gained importance (cultural fashion and new scientific paradigm?); 2) The scientific and political features of climate change and how climate change is linked to the debate on growth and on the future of the Earth system. And simulations and modelling practices, in both domains.

I. "Epistemology is politics", Heinz von Foerster wrote. He was one of the forefathers of systems theory, who looked into the conditions that lead to information theory during the cold war. This quote synthesizes well the conclusions drawn from many studies on the history of science on this period : Peter Galison on cybernetics, Lily Kay on genetic coding, Robert Leonard on game theory and experimental psychology, those reviewed by A.Dahan and D.Pestre in their book: *Les Sciences pour la Guerre*[12]. These authors have all emphasized a cultural hegemony of war and command, in scientific *conceptualisations* and practices as well, an "ontology of the Enemy, within epistemology" as Galison said.

Would the immediate post-war period have the exclusive privilege to be embodied in a determined singular epistemology? The issue arises when putting into perspective the links between science and politics in History. If one tends to answer no to this question, then when and how did our world change? Recent studies on the contemporary situation (see "mode 1/mode 2" or knowledge production systems) have stressed that Science - State - Market relations have changed, especially regarding the new role of the latter. Without denying their relevance, I would argue that future reflections and research should also focus on more « diffuse » issues such as: cultural values of knowledge fields, knowledge hierarchy and disciplinary cartographies, technological utopias, the imagination and commitments of the scientific and epistemic communities. It seems that these questions have played a crucial role in the various shifting, resistance or innovation processes (open source…) over the past decades. They helped define contemporary links between epistemology and politics.

Thus, since the 1980s, a cultural fashion for chaos and disorder, related to the take off of several disciplines[13] and to social and industrial requests for studies on technical issues or on unstable and turbulent phenomena. However, the vogue spread far beyond scientific communities and reached various community spheres (intellectual, managerial, political, artistic, etc), thus participating in the **making of new worlds**, where notions such as instability, branching, uncertainty, emergence or scenario prevail. This trend is related to May 68, to a certain weariness towards large big-science reductionist programs. Eventhough scientists are now over this chaos phase, it left irreversible marks and allowed knowledge acquisition[14]. Nowadays, it is replaced by a **discourse on complexity** that seeks to embody a new way of conceiving and practicing science. The joint physical, biological and social approach of Man and Nature, which used to be that of Environmental science, is now widespread, together with such notions as risk society, precaution or sustainable development.

[12] EHESS Press, 2004.

[13] Including the mathematics of dynamical systems, the physics of mixtures or sand heaps, computer science, engineering science etc

[14] Especially Interdisciplinarity science, which appeared in the 75-85s with "the science of chaos", still prevail.

To put it in a nutshell, I suggest that there should be a search for a narration that would try and interrelate the epistemological and political dimensions of the past five decades. Jointly, a chronology of significant political events and a chronology of epistemic shifts in science should be run.

II. Science as well as politics are altered by **globalization**. Putting this phenomenon into a historical perspective requires thinking **how local and global dimensions were articulated** in the past century. The future of the Earth system is involved in many scientific and political issues such as: climate change, biodiversity, energy issues etc[15] ; the issue was raised as early as 1971, with the report to the Club of Rome (*The Limits to Growth*, 1971). Not only did it introduce the framework of a debate on growth but also the argumentation tools of this debate: global mathematical models. It is striking to notice that these tools remain, even if they are much more sophisticated now, and that they are used in the controversies surrounding climate change policies and in the negotiation arena. Actually, the **role played by economic sciences** (and economists like W.Nordhaus) has dramatically grown at the interface between science and politics and deserves to be reconsidered[16].

Paradoxically enough, it seems that the **purely national scale** has been insufficiently explored in order to grasp the articulation between science and politics. Though many studies on the history of science mention this scale, they only do in the prospect of monographies, scarcely ever in **comparative prospects**, which would allow the analysis to be not only descriptive but also **prescriptive.** Here, I refer to the last book by Philippe d'Iribarne, *L'Etrangeté française*, in which the author systematically compares the notions (or feelings) of liberty, equality, justice, social recognition, etc in diverse European countries (France, Germany, Great-Britain..) by putting these notions into the long and thick intellectual traditions (philosophical, litterary, political) of these countries. A similar study around such notions as scientific truth, rationality, scientific consensus, expertise would enlighten the different meanings they carry in various countries. The notion of "*civic epistemology*", introduced by Sheila Jasanoff, has been criticised, but deserves to be looked into, as well as the notion of *national expertise culture*. Indeed, the study of **governance** processes in the international arena of climate demands to be associated to that of national and regional (Southern countries) climatic valuation mechanisms, which largely depend on the political traditions and democratic ways of living of the diverse countries.

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[15] Several disciplines or scientific groups consider the Earth system and its future as an object of science (!), which does not go without saying.

[16] An institution such as IIASA (Vienna) calls for research on its role throughout the past three decades (global modelisation, prospective, energetic prospective, geopolitics ..)

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David Edgerton

The issue of policy relevance has been long-standing in both history and the social sciences. In the case of STS, broadly defined, policy-utility of the knowledge produced has long been central – take the work of Chris Freeman and SPRU from the 1960s, and Liberal Studies in Science and its descendents in Manchester. It would be a mistake simply to lament a supposed lack of influence, much less a supposed failure even to think about these issues.

The relation of history to science policy and the politics of science is more complex. On the one hand history is very necessary to provide examples of the power of science and technology, on the other hand new science and technology is allegedly so radical that there are no lessons from history. But, the historical study of claims for the significance of this or that science, or mode of organization or knowledge production, etc, and the influence of such claims on historiography can be very powerful. Far from being original, most arguments for investing in a particular science and technology are resolutely old-fashioned. New sciences and technologies have been promising much the same thing for many decades; the arguments stay the same, only the science or technology changes. Like all those cults proclaiming the end is nigh, which are hardly likely to dwell on the history of such claims, scientific and technological boosterism relies on, and encourages, forgetfulness. History is extremely effective in bringing such claims to earth. To find themselves reproducing tired early twentieth century clichés is not a happy position for those who believe they have the future in their bones. The sheer lack of novelty in contemporary analysis of science undermines the claims to authority and to novelty that are so common in reflections on the scientific and technological present. This is not, of course, to deny there is novelty, far from it. But getting at what is novel is much more difficult than we might think.

Of course, particular kinds of history has already been important both to policymakers and politicians. In the case of Britain, the historical story of the decline of Britain due to lack of science and technology, was central. Many of these historical stories I have labelled call anti-histories. The issue has not been one of bringing history to those ignorant of history, but rather of understanding the nature of the historical arguments to be challenged. A critical case in this context was and is the (false) assumption (still very powerful in science policy circles)

that there is a positive correlation between national rates of innovation and national rates of economic growth. It was one example, of many, of the propagandistic arguments of scientists and engineers in the past being turned into historical givens by historians. As it happens around 1996/1997 new anti-declinist histories coincided with a decisive shift away from declinism by the scientific elite.

From this we may take some further observations. First that a 'deficit model' of history in policy is misleading – the history is already there and is important. Second, that history is not itself immune from amnesia (and novelty-mongering). Third that much history of twentieth century science incorporates within itself, indeed is structured around, concepts forged in old policy debates.

Discussion of science, and science in/and society, is particularly prone to be discussed in futuristic, amnesiac mode. Thus science is defined in relation to novelty and the future, as is technology. Science becomes research; technology becomes innovation. So deep is the association that the distinction, and especially its significance, needs spelling out. For the futurism of the present, and of the past, has even become inbuilt in historical accounts. Thus if we ask what are the significant sciences and technologies of particular historical periods in the twentieth century we find the literature telling us about publicly visible and resonant sciences and technologies at or near innovation. The history of science is dominated by the early history of particle physics and molecular biology. People might notice if one left one computing, but the omission of chemistry is by these lights unremarkable. The list of supposedly crucial technologies, and the periods of supposed centrality are equally distorted by the same factors.
Reflecting the cultural power of academics, as well as other processes, the history of science is dominated by the history of academic research; the history of science policy is dominated by the history of bodies most closely connected to the academy – the DSIR in Britain, the NSF in the US, etc. This gives us a wholly inadequate account of the policies for and politics of science, of the centres of power and influence. In other words, we could do with a rather significant re-mapping of twentieth century science and technology. Without it we will continue to be plagued by significant category errors in the literature on twentieth century science and science policy. Thus, the kinds of questions which Dominique asks perhaps cannot yet be answered for most of the twentieth century.

Much less can we comment seriously on the transformations of the recent past. What we can do is to challenge existing influential arguments, feelings, suggestions, cliches. Are we moving into a new, weightless, information society? Is the rate of change ever increasing, or at least greater than in the past? Is new technology transforming our world; is the world radically novel? Were 1989 and 9/11 radical turning points? Has the university been radically re-oriented to industry? Are we moving into a new mode of governance of science? My answer to all these questions is No. The evidence is not there.

We need to lose confidence in our existing accounts and its basic assumptions about significance whether of particular sciences, or institutions, or technologies. At minimum we need to reject the history implicit and explicit in discussions of 'Mode II' and of the 'linear model of innovation', or 'long waves'. Some say, with reason, that Mode I, the linear model of innovation, or long waves never existed.

Marwa El Shakry

I would like to propose two broad themes concerning the domain of 'science and politics'.

The first concerns the question of the geo-politics of modern scientific knowledge production; the second deals with questions of international legislation and regulation; both are concerned primarily with science in the non-Western world.

[I] On the geo-politics of knowledge-production, I suggest three spheres of enquiry: [i] the idea of the universality of science; [ii] the legacy of empire; and finally [iii] the impact of decolonisation and the Cold War on the construction of 'development' ideologies.

[i] In order to address the question of the historical and contemporary geopolitics of science we must first consider the question of science and place, or put differently, the problem of the universality—versus locality—of 'science.'[17] To this end, I would ask: How was the cultural authority of science—as universal, objective and value-free—secured, particularly in the extra-European world during the heyday of positivism, scientism and imperialism? How did this help to ensure that certain pre-existing concepts and forms of *local* 'knowledge' could thus be assigned—or, conversely, be refused—the status of *universal* 'science'? And what does this process have to tell us about contemporary categorizations of 'traditional' or indigenous forms of knowledge-production as opposed to internationally recognized ones?[18] [Current debates over medical pluralism, or in the current terminology of the WHO, 'intercultural health', would be one significant example of this.] How, in short, has the idea of a 'universal' science helped to create distinctions between different forms of knowledge-production globally and how does this affect their subsequent appropriation, regulation and control today?

[ii] Historians, sociologists and anthropologists of science have only recently begun to explore the complex interaction of science and imperialism.[19]

That the production, transformation and spread of modern science—as with the spread of ideas, peoples, goods and capital more generally—can scarcely be understood without attending to the imperial context is now well acknowledged. Science was not only an instrument of empire but often a justification for it [particularly through the ideology of the 'civilising mission']. Recent work by Hardt and Negri, moreover, highlights the confluence of empire and regimes of bio-power, or the regulation of life as an 'object of power' in the context of [neo] imperialism[20]. Yet what perhaps needs further attention is the double-edged impact of empire on attitudes towards modern science in the colonial and post-colonial world. The spread of Darwinism in the nineteenth century Middle East, for instance, was conditioned by its association, in the minds of many, with liberal laissez-faire [British] imperialism. Following the Bolshevik revolution, a later generation turned instead towards a self-consciously socialist model of collectivism in nature [and society]. It was these geopolitical

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[17] On the idea of universalism see most recently, Immanuel Wallerstein, *European Universalism: the Rhetoric of Power* (New York, 2006). An interesting analogy is with the current debate over universalism and Eurocentrism in the construction of international law: see Antony Anghie, *Imperialism, Sovereignty and the Making of International Law* (Cambridge, 2005). On the mobility of knowledge-production in science—as 'immutable mobiles'—see: Bruno Latour, *Science in Action* (Cambridge, 1987).

[18] Cf. Helen Watson-Verran and David Turnbull, 'Science and Other Indigenous Knowledge Systems' in Sheila Jassanoff et. al. (eds.), *Handbook of Science and Technology Studies* (Thousand Oaks, 1995): 115-139.

[19] The first study to deal with this topic is usually taken to be George Basalla's 'The Spread of Western Science: A Three-Stage Model Describes the Introduction of Modern Science into Any Non-European Nation,' *Science* 156 (1967): 611-622. Basalla derived his model from Cold War ideologies of development, drawing, in particular, from Walter Rostow's *The Stages of Growth: An Anti-Communist Manifesto* (Cambridge, 1960). For a recent exploration, see: David Wade Chambers and Richard Gillespie, 'Locality in the History of Science: Colonial Science, Technoscience, and Indigenous Knowledge,' *Osiris* 15 (2000): 221-240.

[20] Michael Hardt and Antonio Negri, *Empire* (Cambridge, 2000).

shifts, far more than the power of supposedly immutable local traditions or religious texts, that explain changes in prevailing attitudes towards science in the Middle East and elsewhere.[21] Many in the 19th century [and after] recognized the specific geo-political dimension of science, something which could equally damn or endorse it as a means toward [inter]national political power and control.

[iii] The transformation of the 19th century civilising mission into new forms of development discourse in the 20th century—exemplified by the British Colonial Welfare and Development Acts of the 1920s to 1940s—remains crucial for understanding the geo-politics of contemporary scientific production and sponsorship. The Cold War globalised the discourse of development and was fought out through it. It thereby cast a shadow upon the idea that science was ideologically neutral. Both Lysenko and Borlaug (and subsequent researchers involved in the Green Revolution), for example, conducted research on the vernalisation of wheat seeds but they came up with wildly different conclusions. It would be difficult to understand the modern history of genetics and of agricultural science, or the modern politics of famine for that matter, without understanding this geo-political and Cold War competition[22]. One set of questions that might be explored in future therefore concerns the development of new arguments surrounding science, ideology and economic production in the Cold War era and the legacies of the confluence of science funding and political power today. The idea that science and technology simply provide rationalizing mechanisms in international development, rather than sites of political power, scarcely needs spelling out in this regard. One example of the contested role of science in global development strategies may be appreciated in the case of current biotechnology research. Egypt, for instance, received US$ 40 million from USAID between 1989 and 1995, of which 1/4 of this was spent on biotechnology R&D. Recent studies indicate however that funding strategies such as these have a tendency to adversely affect local research initiatives and to skew national research priorities and agendas[23]. From this point of view, a comparative analysis of how different international donors understand and define development would no doubt prove illuminating.

[II] In thinking about the second point, namely the international legislation and regulation of science, technology and medicine, I would like to focus primarily on the contemporary debate over knowledge-production rights and ownership and on the problem of intellectual property rights [IPR] in the post-colonial context in particular.

Many countries have witnessed a widespread nationalisation of science, technology and medicine. Yet this has also coincided with the global commodification of scientific knowledge-production and the deployment of commercial strategies such as the use of patents[24]. The international development of IPR and patents, moreover, has followed closely on the heel of debates about bioprospecting or 'biopiracy,' i.e. the patenting of indigenous biomedical knowledge by multi-national corporations and pharmaceutical companies. The politics of knowledge-production and rights thus opens up a series of questions regarding the ethical implication of IPR regimes and their role in the promotion of—or impediment to—

[21] See for instance, my 'Darwinian Conversions: Science and Translation in Late Ottoman Egypt andGreater Syria,' in Anne-Marie Moulin et. al. (eds.), *Modernité et modernisation de la science dansl'Empire ottoman et au Proche-Orient, du XIX*e *siècle à nos jours* (forthcoming, Paris, 2006).

[22] See: John Perkins, Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War (Oxford,1997).

[23] Bram de Hoop, 'A Case Study on Egypt: The Effects of External Funding on Biotechnology Transfer,'*Biotechnology and Development Monitor* 28 (1996): 18-22.

[24] On the historical development of IPR, see: Mario Biagoli and Peter Galison, *Scientific Authorship: Creditand Intellectual Property in Science* (New York, 2003)

research development and innovation in science.[25] Recent historical work on the 'Ghana Quinine' plant [*Cryptolepis sanguinolenta*] and on the Hoodia cactus suggest that both the socio-economic repercussions and ethical implications of IPR regimes for traditional biomedical knowledge are uncertain and point to the need for more equitable legislation and regulation in this arena. Nor do these concerns pertain only to so-called traditional biomedical knowledge. The post-1993 WTO Agreement on Trade-Related Aspects of Intellectual Property Rights [TRIPs] implementation and regional trade agreements with stringent IPR requirements also threaten to hinder access to medicines in many poor and developing countries and to exacerbate growing international health crises such as the HIV/AIDS pandemic. While many argue that TRIPs allow for greater research innovation and technology sharing, the 2005 WTO generic drugs waiver suggests that this approach is currently being reconsidered. A historical and trans-national analysis of IPR schemes on this front would thus no doubt prove invaluable.

Yaron Ezrahi

The changing relations between science and politics.

In contemporary democratic states, socially relevant knowledge appears too complex and underdetermined to effectively check arbitrary political power, and power has become too diffused to guide and effectively regulate the production and uses of socially and politically relevant knowledge. The increasing commercialization of public services and functions, and the shifts of state powers to principal private actors in the market have been eroding both the authorities of scientists and politicians to speak as collective nonpartisan voices respectively in the name of Science and the State. This fragmentation of the voices of knowledge and the public, this depletion of the authority to view policy issues from the synoptic or integrated perspectives of science and the state viewed respectively as wholes, is perhaps the most important cause of the reconfiguration of the relations of science and politics in our time. An increasingly wider recognition that Enlightenment visions of the role of scientific knowledge in inducing political consensus, rationalizing the political, and improving the apolitical instrumentality of the state in the service of public goals have been utopian, has prepared the way for more realistic appreciation of the problems that the relations between scientific knowledge and politics raise[26].[1] Contemporary historians, sociologists, anthropologists and political scientists are now in a much better position to recognize the persistent series of systematic misunderstandings between members of the communities of science and politics, the related discontinuities between their epistemologies, norms, and practices, and their implications for future relations between science and politics. One of the main questions before us considering these fragmentations, discontinuities, and constraints is what can be done to enhance under **these circumstances,** the production, regulation and adaptation of scientific knowledge for social and policy choices.

[25] For more on this, see: Shane Greene, 'Indigenous People Incorporated? Culture as Politics, Culture asProperty in Pharmaceutical Bioprospecting,' *Current Anthropology* 45 (2004): 211-237.

[26] [1]Yaron Ezrahi, *The Descent of Icarus, Science and the transformation of contemporary Democracy* (Harvard University Press 1990)

Discontinuities between the cultures and practices of science and politics.

Without getting into details I would like to note first epistemological discontinuities between the ways scientists and citizens respectively know things together. "Civil epistemology" which consists, among other things, of what makes citizens accept claims of fact and what underlies lay distinctions between facts and fictions, is profoundly different from the criteria used by scientists[27].While partially valid, the persistent view that laymen are usually wrong and need the guidance of experts tends to ignore the role of such crucial building blocks of the political order as regulatory fictions. To illustrate, Thomas Hobbes insisted that regardless of whether people are, or are not, "equal by nature" such "equality must be accepted" otherwise "men that think themselves equal will not enter conditions of peace"[28]. In politics as in law some fictions must enjoy the status of fixed reality in order to enable the working of particular sets of normative practices.

Another systematic misunderstanding between scientists and politicians concerns attributions of causality. Scientists will normally tend to first attribute causalities, linking actions and effects, and only then assign and distribute responsibilities (if at all). They are often likely to unknowingly clash with politicians who will tend first to attribute responsibilities and then tailor to them the supporting concepts of causality. This is connected with the salient role of motives in political accounts of behavioral outcomes and with the dynamics of political legitimation and delegitimation contests.

The short-circuits between experts and politicians are further complicated by the discontinuities in their respective time frames. One of the most distinct features of contemporary politics is the short life expectancy of political powers, mandates, and reputations. Political actors often prefer the instant political pay offs of gestures in the media than the much more distant political pay offs of substantially successful policy decisions. Hence often experts who are actually used in the "choreography" of political gestures start working innocently convinced of their mandate are destined to a rude awakening along the way! The point I am trying to make is that such difficulties stem largely from structural and normative factors which cannot be simply corrected by better information or management. The norms and practices underlying the production and diffusion of knowledge are largely incompatible with those underlying the production and sustenance of politically legitimate authority and power. The other side of these discontinuities and systematic misunderstandings is, of course, that the production of political authority and scientific knowledge, two invaluable social assets, depends on distinct configurations of institutions and orientations. The tensions between the two perspectives are in many respects unavoidable and not infrequently even desirable. Science and politics, which are sometimes partners in the production of the social order, are often also adversary actors in the co-production of social disorder.

Tentative suggestions and questions

Perhaps the main point I would like to make is that contrary to the influential Enlightenment

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[27] Yaron Ezrahi, "Technology and the Civil Epistemology of Democracy" *Inquiry*,35, 363-76; see also Sheila Jasanoff, *Designs of Nature,Science in democracy in Europe and the United States.* (Princeton University Press 2005).

[28] For an overview of the relations of science and politics see "Science and the State" by Yaron Ezrahi in the *International Encyclopedia of the Social Sciences Vol 20* pp13657-13664, Smelser and Baltes editors (Elsevier 2001).

vision, and its reflections in the ethos of science and the education of scientists, political discourse and action are not just arbitrary, "irrational", or uninformed. They are controlled primarily by the logic of the means and norms with which the political order is constructed and sustained. Hence they cannot be reduced to scientific knowledge and technical rationality. As Vico observed, in politics "believable impossibilities" are very important. So experts have to learn to appreciate the ways political actors frame the problems they are asked to work on and extract from them the parameters of their own discretion as experts.

- In the areas of socially and policy relevant knowledge a cooperation between the state and the professions is necessary in order to ensure the integrity of standards and procedures for packing knowledge in policy contexts and regulating the uses of knowledge by public agencies and market forces.

- In order to sensitize scientists and other specialized experts, to the distinct norms and practices of politics and public administration, and to the need to integrate knowledge into the civil epistemology and practices of any particular polity, it may be useful to introduce **required elementary courses** in political science, organization theory, law, and sociology in the training of scientists.(Such courses can use for instance Jasanoff"s recent *Designs of Nature* to show how the same biotechnological knowledge has different rhetorical and political imports in different countries and how this bears on its reception and integration in these countries.)

- The massive uncharted convergences and interpenetrations of scientific knowledge and politics require new modes of combining professional and political procedures for the double intellectual and political legitimation of claims or outcomes in the context of public affairs. This may necessitate also new ways of thinking of, and conceptualizing, factual reality. A step in this direction could include for instance the cultivation of a generic concept of reality which would be compatible with diverse extractable specialized facts which could not appear to coexist in conventional monistic imaginaries of the real. While historians and social scientists working in this field are deeply aware of the multiple procedures for the production of "facts" in our time, monistic imaginaries of reality are pervasive among laymen and deeply entrenched in contemporary common sense.

- The transition from an era where science was largely used as a resource for depoliticizing power and decisions to an era where science functions openly as partner in rival political legitimations, requires new ways of framing the relations between science and political values which keep the integrity of scientific knowledge while integrated into plural value and adversary environment without the former privileges of knowledge imagined as separate or compartmentalized outside the political context.

- More generally I think that in this era of globalization and the penetration of market values to the most sensitive domains of security, health, and science it is necessary to restore the authority of the state as a principal regulator and coordinator of joint experts and public servants forums for defining standards and procedures aimed at achieving collaboration while keeping the integrity of both scientific ways of producing and certifying knowledge, and democratic processes of legitimating and using political power.

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David Gaston Between *Politics and Science, Assuring the Integrity and Productivity of Research* (Cambridge 2000).
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Stephen Hilgartner, *Science on Stage: Expert Advice as Public Drama* (Stanford 2000).
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Jean-Baptiste Fressoz

Reflecting on the Risk Societies of the Past.

There is today an assumption, shared by most thinkers of post modernity that for about two generations we have been experiencing a complete transformation of our relationship with science, progress and risk. As modern technologies have radically changed the scale of human action, risks have changed in nature; they are global, concern future generations, and pose threats to human nature and existence. Pillars of the industrial society's management of risk such as insurances, technical norms and expertise have been undermined. More profoundly, the consensus on progress, which glorified technological achievements, has been breached and innovations are subjected to a new kind of prudence and to social debates.

I would like to challenge the purported *radical* novelty of our situation. I believe that the historical narration that underlies contemporary literature on technological risk is (in part at least) a construction which, for the sake of sociological argument, has reduced past risks to somewhat reassuring categories. Contrasting our nuclear and biotechnological times with the old days of coal and steam, when technologies were supposed to be simple enough and the risks limited and insurable, legitimizes at a theoretical level new forms of political engagement and risk assessment, and the call for democratic participation in technological choices. However, this comparison has the defect of overlooking the polymorphous nature of risk in the nineteenth century and the perplexities that contemporaries expressed in the face of their new technological powers. It also prevents us from understanding that these perplexities, and the social mobilization that they fostered, had an essential role for the construction of safer technologies.

The alternative position I would like to propose in this workshop is to historicize the "risk society" thesis and use it to understand better the relationship between technoscience and society in the nineteenth century. This is not only a retrospective construction: French thinkers of the mid-1850s already discussed modernization in terms of the transformation of risks. I can mention a completely though unjustly forgotten philosopher, Eugène Huzar, who in two books of great interest, *La Fin du monde par la science* (1855) and *l'Arbre de la Science* (1857) reflected on such problems as the impossibility for science in forecasting the effect of human action on the environment, uncertainty, or unpreventable catastrophes. So as to prevent or postpone the technological apocalypse he advocated for an international regulation of nature and innovation.

In the lively field of risk studies, historians have not been very vocal. However, an historical inquiry on technological risk could, nevertheless, lead in interesting directions. First, it should invites to use the risk society concept as a plural: distribution of knowledge, role of the public sphere, ways of producing knowledge on risk, values and practices of expertise have (obviously) changed greatly across time and space. By exploring risk societies of the past, such an inquiry would help for a rethinking of what is really changing in the

past, such an inquiry would help for a rethinking of what is really changing in the relationship that our contemporary societies have with technoscience.

But the input could go beyond this much needed historicization. In sociological debates about risk and expertise, historians could bring an essential input: hindsight. Indeed, they can objectify risk by studying accidents that occurred during centuries. A kind of "retrospective technology assessment" could help to think such problems as: how far uncertainty goes when we do forecasting about complex technologies? What mode of knowledge production did produce the most interesting knowledge on risk? What kind of regulation (judicial, administrative, by the insurances…) was most efficient?

Finally, taken in the long run, technological innovations do not appear as rigid, external objects that society has to accept or refuse. They should rather be conceived as fluid techno-social entities that can take very different forms according to the nature of the regulations and the social mobilizations for safety that surrounds them. Hence what in history of technology is traditionally put in the footnotes under the label of "opposition" or "resistance" to progress turns out to be essential for the construction of safer technological systems. After having shown how technologies embody gender and power relations, historians of technology could also describe how artifacts have crystallized the conceptions that past societies had of acceptable and legitimate risks.

For starting the discussion, I can provide a series of case studies ranging from inoculation and vaccination against small pox, chemical industries, gas lighting, and steam technologies which all fostered considerable amount of anxieties, debates, accidents, pollutions and regulations.

Short bibliographical account:

JB Fressoz, "The Gas Lighting Controversy: Technological Risk, Expertise, and Regulation in Nineteenth-Century Paris and London", Journal of Urban History, Special issue on cities and environmental history, forthcoming, January 2007.

JB Fressoz, "Beck Back in the Nineteenth Century. Historicizing Risk Society in the Long Run". *History and Technology*, forthcoming.

I won't detail the literature on technological risk which is broad and well known. Ulrich Beck, in *Risk Society* (or the very clear summary "From Industrial Society to Risk Society", *Theory, Culture & Society*, 9, 1992, 97-123) try to reflect on what has changed since the last forty years and thus provides a stimulating starting point for historical discussion as well as a theoretical framework.

The histories of inoculation and vaccination have been well studied and refers incidentally to the question of the risk of these practices.
Pierre Darmon, *La longue traque de la variole*, Perrin, 1984 provides a comprehensive history of vaccination written in a very positivistic way.
Lorraine Daston, *Classical Probability* contains an illuminating account of d'Alembert subtle psychological theories of risk taking about small pox inoculation. Andrea Rusnock's *Vital Accounts. Quantifying Health and Population in 18 C France and England*, is good on the description of risk quantification by Jurin secretary of the Royal Society in the 1720s.
For a study of "vaccination resistance" as a series of discourses on vaccination see Nadja Durbach, *Bodily Matters: the Anti-vaccination movement in England, 1853-1907.*

Interest in environmental history is only starting in France. Genevieve Massard Guilbaud, *Histoire sociale de la pollution*, forthcoming should provide with such a history but from an administrative point of view mainly.

Jean-Paul Gaudillière

The public, the private, and the making of evidence.
A few remarks on science advocacy, mode 2 and the history of science.

Before reading the following statement of interests, I suggest you pay a visit to the web site of the Center for Science in the Public Interest, a non-governmental organization based in Washington.[29] The CSPI has played a significant role in coordinating the opposition to the various ways in which the Bush administration tried to reshape environmental expertise in order to give voice to scientists explaining that climate change is still a matter of controversy. For a few years, the center has also been running a campaign on the evaluation of drugs, putting the committees of the US Food and Drug Administration under scrutiny for conflicts of interests and biased assessment.

This campaign is coordinated by Merrill Goozner, a former journalist and author of *The §800 Million Pill*, a book on the changing relationship between science, drug innovation, and the industry. The book is part of a recent wave of public interventions, which express deep concerns about the deterioration of biomedical practices in our post-modern free-market societies. Four patterns are at stake: the commercialization of knowledge associated with the patenting of natural entities and general processes; a decreasing ability to invent drugs with the companies concentrating on block-busters employed in the management of health risks or the enhancement of the body performances; a reinforced role of the individual patient and consumer who can negotiate treatment and sometime directly access therapies or diagnostic (at least when he/she can afford it); the alignment of public institutions making medical knowledge on the entrepreneurial model of action. These patterns have accordingly led to a degradation of the standards of clinical research with "me-too" trials, reinforced intellectual property, unpublished negative results, contract research organization proposing prominent clinicians ready-to-sign articles, etc.

The responses advanced by the SCPI focus on the making of a better science, more "basic", more "public", and relying on improved methodological standards. The propositions include the creation of a state agency for clinical evaluation in order to take the organization of clinical trials out of the hands of the private capitalistic firms, the systematic publication of negative results, as well as a mandatory testing against existing therapy rather than placebos.

This plea is not isolated. It resonates with a broader movement for "evidence-based" medicine, supported by actors ranging from NGOs to state administrators or medical societies. Highly heterogeneous in its composition, this movement has played a significant role in the contemporary "standardization" of medical practices, a processes marked each year with the production of thousands of guidelines, norms of practices, and meta-analysis of published results. Although they may be critical of the standardizing powers, many health activists share the idea that sound mandatory trials are the main resources for a biomedical research in the interest of the public.

Science studies are in an uneasy position when facing the critical arm of evidence-based medicine. On the one hand, its proponents look at the context of knowledge production, they back the idea of a more open assessment of science if not the notion of distributed expertise. On the other hand the responses they further – basic research, state control and sound methodology – will appear naïve if not mistaken to historians and sociologists aware of hybrid networks, multiple interests, interpretative flexibility, open controversies and local

[29] www.cspinet.org

brid networks, multiple interests, interpretative flexibility, open controversies and local consensus.

One way to accommodate the tension is to consider that the plea for a "better science in the public interest" is a tactical move, well adapted to the US situation, and beyond to this region to a political and economical context of global entrepreneurship and deregulation. But this is a cheap solution, leaving unaddressed the main source of trouble, namely the problematic resonances between the ideology of a new, consumer, risk and project-oriented capitalism, and the emphasis science studies have put on the role multiple and equally important actors play in a contingent, flexible, and locally determined of knowledge.

The discussion about controlled clinical trials is a telling symptom of this reflexive challenge. Taking the Aids movement as paradigm, the STS literature has shown a tendency to describe the ways in which patient activists have participated in the drug evaluation process terms showing a move toward more participation, individual choice, personal experience, and organizational flexibility, away from a black-boxed system, dominated by statistical standards and bureaucratic administrations. In other words, Aids is a typical example of the positive sides of "mode 2" biomedicine.

True, the complex relationship between patient organizations and the pharmaceutical industry have not passed un-noticed. Analysts like S. Epstein have discussed the conflicts generated by the acculturation to biomedical norms or the financial support of the industry within the patient organizations. Problems associated with broader social and economical regulation like the difficulty to translate the patients' experience into legitimate research, the specificity of the Aids story, or the wider effects of the accelerated system of market authorizations the Aids movement helped establish have remained on the margins. When it comes to these "big" issues, historians of STM fare a little better. In the SSK vein, they have discussed the on-going controversies and practical complexity of drug evaluation as opposed to the idealized methodological soundness of statistically organized trials. They have also looked at the power balance and the structural tensions, which characterized the post-WW2 alliances and battles over the controlled clinical trials as mandatory element in the state-based regulation of the pharmaceutical market. Of course, controlled trials are not the wonderful tool for market control and objective regulation medical reformers were dreaming of. They became instrumental in the making of specialties, the construction of markets, or the marginalization of GP's and patients' experience. A proper historical account nonetheless needs to take into account the margins for "making things public" their existence has contributed to create.

Addressing the serious questions raised by the Center for Science in the Public does not imply that we adopt the same discourse of basic, public and methodologically sound research. It however requires a displacement of our questions in this direction, i.e. toward a deeper understanding of the political economy of science, of its mode of appropriation and regulation; but without shying away from the question of what is a better evidence.

Kostas Gavroglu

Aspects of the sciences and politics in the European periphery

The following is an attempt to outline a framework in order to examine the specificities of what is loosely referred to as European periphery. Though the notion is quite problematic, it is

quite useful for analyzing a number of quite pressing issues, within the new realities of the European Union.[30]

Problemitizing European periphery

Perhaps one of the most neglected aspects in both the history of science as well as in the discussions about policy making, is the systematic analysis of various sites in the European Periphery: To what extent has European Periphery been problemitised within history of science and to what extent have its characteristics been understood as autonomous features reflecting independent entities rather than being reflections of the center?

In discussing the relations of science to politics, it may be interesting to question the category of European periphery for history of science, by articulate the argument that Science and Technology in the European Periphery, from the Scientific Revolution to the 20th Century, is a novel historical problem, and when examined from the context of the receiver, it needs a network of new concepts and approaches, it leads to a number of reconsiderations, and provides a number of new conclusions. The network of the problems involved, are radically differentiated from the *problematique* about colonial studies and the gnosiological, ideological, social and political differentiations between the problems one is studying and colonial studies, are so different as to make the two, distinct historical problems.

Of course, the whole notion of periphery, brings into the fore the rather simplistic bipolar distinction between center and periphery. Though such reference of center and periphery is useful for broadly delineating the situation, it is incapable of capturing many salient details of the introduction of the scientific ideas in the societies of the European periphery, since historically in Europe there were many centers and many peripheries, not all centers and all peripheries shared the same characteristics, a place may at one and the same time be both center and periphery, and, also, a single country may contain both centers and peripheries. Still, despite these difficulties, it is useful to talk in terms of center and periphery.

The elusive notion of European Science

In a 1995 White Paper on the question of unemployment and on the ways young people can gain as many skills before finishing high school, the European Union proposed that history of science and technology be included in the school curricula.[31] It was no doubt a good recommendation but for the wrong reasons. The White Paper suggested that by learning the history of science, and especially the history of technology, young people will acquire knowledge of a variety of skills and techniques and will become aware of the boundlessness, as it were, of human inventiveness. It was noted that science had been a European phenomenon, that modern science has been born in Europe and that it should be taken as our common European heritage. From these, it is but a short step, to be confronted with the elusive notion of European Science. *The danger of Europeanizing everything looms dangerously in Europe today, since Europe, as expressed by its new institutions, is badly in need of homogenizing everything, and the history of the sciences provides the obvious case.*

[30] Much of what will be argued has been discussed in the regular meetings of the STEP (Science and Technology in the European perihery) group, founded in 1999. I am particularly indebted to Gurol Irzik from the University of Bogazici in Istanbul, Agusti Nieto Galan, from the University of Barcelona, Manolis Patiniotis, from the University of Athens and Ana Simoes, from the University of Lisbon.

[31] White Paper published by the European Commission titled *Teaching and Learning: Towards the Learning Society* (Luxembourg, 1995). See sections II.B and C.

Here is one of those instances where there is such a dichotomy between political goals and the aims of an academic pursuit. Never mind that historians of science have been trying to articulate local differentiations and trying to bring to surface the deviations from the view that holds the scientific enterprise to be an all inclusive homogeneous practice. It seems, however, that European integration needs ‘’European’’ notions like European Science and the specter of European science will be continuously finding justification.

So here is another dimension about the sciences in the European periphery: Talking about the periphery will result in articulating differences and not in seeking identities. The view which considers the sciences at the European periphery as the out-of-focus reflections of what has been happening at the center is mostly for ideological use. *The history of the sciences at the periphery is not an attempt to chart the map of the watered down version of what happened and is happening at the center.* Equivalently, the same appears to be true for matters concerning science policy.

Historiographic mentalities as ultimately ideological positions on modernity

By critically (re) assessing entrenched historiographical mentalities in many localities of the European periphery, one realises that ideologies of national grandeur often dominated the choice of themes and their subsequent discussions. This, together with the rhetoric of modernization which over the last decade has been the prevailing *political discourse*, conditioned most of the ensuing institutional reforms, the ‘’official’’ histories of many countries of the European Periphery have been stigmatised by the images of their distant past, while most of the changes in academia and research institutions have been part of political programs to bring about symbolic as well as substantial breaks with the repressive policies of dictatorships in their recent past (Greece, Portugal, Spain, especially).

Most of the historical works produced in or referring to the countries of the periphery which examine issues concerning the introduction of both the ideas of natural philosophy and the techniques developed within the new framework after the 18^{th} century, move about a dipole, each pole being populated by historians whose historiographical choices and interpretative attempts brought about tensions with somewhat ideological and nationalistic undertones. One group with strong attachment to the historiography of transmission studies for the European Periphery would claim that the history of science is, in effect, the history of all those who had become the bearers of Enlightenment (and modernity for more recent periods) in their respective societies. Even though the scientific competence of these scholars is not taken too seriously, these individuals are considered as the protagonists of the dissemination of natural philosophy, since these (enlightened) individuals were, literally, the carriers of Enlightenment. These historians whose work is woven around the themes of the ever increasing phase difference between what was happening in the (developed) center and their own (underdeveloped) periphery, have been challenged by a second group of authors who tried to argue that there had, indeed, been local scholars who introduced aspects of the sciences and technological innovations earlier than most people thought, and that society, as a whole, showed a degree of receptivity not properly appreciated by many of those who examine these themes. Similarly, the work of these historians who champion the causes of the unsung heroes, has been woven around themes of a rather glorious national past underplayed by many historians belonging to the first group, whose almost unconditional admiration of the centers –as has been claimed by the latter group of historians-- has disguised important local ‘’firsts.’’ The local ideologues of westernization are accused by the bearers of traditions for belittling local achievements, while the latter are incriminated by the former for underestimating the multifarious dynamics of modernity.

Transmission *versus* Appropriation

A historiography based exclusively on the concept of transfer can easily degenerate into an algorithm for keeping tabs on what has and what has not been "successfully" transmitted. A historiography built around the concept of appropriation is more comparable to the procedures of cultural history since acceptance or rejection, reception or opposition are intrinsically cultural processes. Such an approach also permits the newly introduced scientific ideas, practices and technological innovations, to be treated not as the sum total of discrete units of knowledge but as a network of interconnected concepts. In other words, the practical outcome of a historiography based on the notion of appropriation is to be able to articulate the particularities of a discourse that is developed and eventually adopted within the appropriating culture by its multiple institutions and traditions. Filtering processes, eclecticism and all kinds of other modifications are at work when they are being introduced in a particular locality. So the emphasis should not be on how fully the centre is being reproduced in the periphery. The emphasis should be in understanding the changes, in assessing the metamorphoses, comprehending the institutional settings which help to bring about and legitimize these changes.

Issues in appropriation

Such a shift of framework from (from transmission to appropriation) facilitates the systematic examination of

- the particular forms of the fusion of scientific ideas and practices with local traditions,
- the specific forms of resistance against these ideas, practices and innovations,
- the extent to which such expressions and resistances displayed local characteristics,
- the procedures through which the new ways of dealing with nature were made legitimate,
- the commonalities and the differences between the methods developed by scholars at the periphery for handling scientific issues and those of their colleagues in the central countries of Western Europe,
- the role of new scientific ideas, texts and popular scientific writings in forming the rhetoric concerning modernization and national identity,
- the prevailing mode of scientific discourse among local scholars, the relation between political power and scientific culture,
- the social agendas, educational policies and (in certain loci) the research policies of scientists and scholars,
- the shifts in ideological and political allegiances brought about as the landscape of social hierarchy changed,
- the consensus and tensions as disciplinary boundaries formed, especially as reflected in the establishment of new University chairs,

Furthermore, emphasis on appropriation obliges one to examine the dynamics and the conditions under which the emergence of *legitimising spaces* for the new ideas and practices become possible. The problem is relatively simple in those cases where we are confronted with the well discerned and clearly defined spaces such as universities, academies, museums, cafes etc. But in many instances in the countries of the periphery one may not be able to even find such spaces. So where shall we direct our attention to find these legitimising spaces? Understanding the creation of such legitimising spaces cannot be achieved independent of understanding the ways resistance has been expressed. Resistance is expressed because there is something at stake, be it cognitive, ideological, or political and, also, because many spaces feel the threat of invasion. Thus, the emergence of specific sites as legitimising spaces is

closely connected with the character of resistance to the new ideas and techniques and the ways such resistance is counteracted. Lacking the institutional framework where activities involving the dissemination of the sciences would be under continuous scrutiny, ideological, social, and political considerations often became the dominant preoccupation of the scholars. Thus in trying to discern the emergence of the *multifarious spaces of appropriation* – or equivalently, in bringing out the multiplicity of legitimising spaces – professional strategies and personal agendas, become inescapably significant dimensions of these studies.

From the geographic to the cultural

Locality primarily directs attention towards dealing with cultural locality and not necessarily with spatial locality. One should substantiate cultural reference in terms of

- cultural affinities,
- dispositions for adoption, and
- potent proclivities to resistances.

Local scientists and scholars formed their discourses by trying to comprehend such affinities of their local culture for the new ideas, worldviews and even techniques. They did their best to take advantage of social and cultural dispositions for adoption. And in equally significant manners, they tried to take into account the potent proclivities to resistances, ever present as part of the very same society and culture which instantiated the dispositions for adoption. While forming their discourses, local scholars were particularly sensitive towards the kinds of resistances they will meet, and hence, such potentialities had to be taken care of before publicizing what they were attempting to do. Hence potent proclivities rather than actual resistances were quite decisive in forming discourses.

Michael Goldman

Producing Global Knowledge, Experts, and Expertise: The Power of the World Bank

As recently as 1990, fewer than 50 million people received their water from private water companies, and most of these water customers were in Europe and the United States. Remarkably, just ten years later, almost 500 million people became dependent upon global water firms for their water supplies, and most of these new consumers live in Africa, Asia, and Latin America. Industry analysts predict that by 2015, more than one billion people from the global South will be buying their water from European-based water firms. These days, a highly indebted country cannot borrow from the World Bank or IMF without producing a domestic water privatization policy as a pre-condition. A new global policy on water has emerged within ten years, but from where, how, and why?

For this workshop and for our collective interests in the production of knowledge on the global level, by global experts, on questions of global significance, this case provokes a series of questions. For example, if at the 1992 Earth Summit in Rio, the issue of water privatization was not on the agenda, and just ten years later at the 2002 World Summit on Sustainable Development in Johannesburg (the largest international conference ever), it was *the* "global policy" on the agenda, how did such an issue *become* a global policy within one decade, and how did it become supported by global experts, and endorsed by eminent panels and global think tanks? How were data collected and analyzed, and how was a "global consensus" produced on water privatization that argues it is the best policy for solving the problem of access to clean and safe water which affects forty percent of the world's

to clean and safe water which affects forty percent of the world's population? How did it become a legitimate regime of truth, circulating quickly and successfully through scientific and political communities around the world?

We could also ask the more fundamental questions about the production of global expertise and its institutional architecture: How did such expertise become real *and* global; how did these think tanks and eminent panels come to be, who are the experts and how did they become equipped to be "global experts," especially on such a new and complex issue? How does a world of global institutions, problem-defining and problem-solving get generated, and legitimated? How do these "sciences" get molded and what is the trial-and-error and debate process? How do the results circulate, especially through capital-poor countries where such local institutes depend almost entirely on international agency funds? How did these particular ideas become key agenda item in places where water is an important social issue, and how did it become translated into policies and loans that turned public-sector water services into privatized ones?

I studied this new "Water for All" policy as part of a larger ethnography of the World Bank and its knowledge-producing capacities, written up in my book Imperial Nature (Yale University Press, 2005). Although it can only be crudely summarized here, I argue that since the early 1990s, the World Bank successfully created a series of global institutions – including a global think tank on water policy (World Water Council), an eminent panel of experts producing well-cited policy papers on water (World Commission on Water for the 21st Century), a global technical network on water and a series of tri-annual World Water Forums -- that mobilized expertise on water privatization. These were all financed originally by the World Bank with the help of its partners (e.g., UNDP, US-AID, Rockefeller Foundation). Most of the directors, eminent experts, or key advisors came from a small club of transnational organizations.

For example, the think tank on water, the World Water Council, was started in 1996 with World Bank funds, and its original governors were senior officials from the World Bank, the French water firm Suez, UN Development Program, IUCN (World Conservation Union), and CIDA (Canada's aid agency). The Council started the eminent panel of experts to produce the widely circulated and cited report "World Water Vision." The experts included Robert McNamara (former Bank president), Mohamed El-Ashry (CEO of Bank Global Environmental Facility/World Bank), Enrique Iglesias (President of Inter-American Development Bank, sister agency of WB), Wilfried Thalwitz (former World Bank VP), Ismail Serageldin (senior WB environmental official), Jerome Monod (chairman of the board, Suez), and Maurice Strong (former CEO of Petro-Canada). These names are recognizable not only as the leaders of the development industry, but also to anyone who works on international water policy, as they are from the same elite network that occupy the boards of directors of other global entities studying and exploring this "Water for All" policy. These expert institutions and networks have helped create what they proclaim as a global consensus on what they see as a global problem with its universal solution: reducing the deprivation of access to clean and safe water *through* the long-term leasing of water-providing utilities to European and U.S. firms. Working for these eminent leaders are groups of scientists and professionals producing the analytic frames to help make the case for water privatization and its positive social-developmental, economic, ecological, and public-health effects.

On the local, national, and regional levels, the World Bank has founded research institutes and training infrastructure for professionals, as well as the labor markets for hiring them. For example, since the mid-1990s, the Bank has helped create and fund more than fifty national-level research and policy institutes in capital cities throughout Africa that train state professionals and produce policy documents on precisely the issues most important to the

sionals and produce policy documents on precisely the issues most important to the agenda of the Bank, WTO, and IMF: trade and market reforms, public-sector privatization, and so on. In 2002 alone, the Bank delivered 560 training seminars to "more than 48,000 participants in 150 countries through collaboration with more than 400 partner institutions" (WBI annual report, 2002). Seminars that were conducted inside World Bank headquarters in the early 1990s are now being run in new training centers inside or alongside state agencies in many of the Bank's borrowing countries. In the past five years, the Bank trained more than 10,000 professionals in water privatization alone (one of many different training topics), and more than half of them who were interviewed by the Bank's pollsters noted that they have since participated in water sector reform in their countries. The World Bank has also financed university-based learning programs, and has laid the groundwork for many of its development partners to do the same. For example, the world's largest water firm, Suez, has funded a graduate program in water policy education in The Netherlands, an endowed professorship, and scholarships and research for students, with its first Ph.D.s now hitting the market.

Obviously such lavish spending on the production of knowledge and the promotion of a specific global policy will never alone create its own global consensus; indeed, there is tremendous dissent and critique being generated worldwide, but it is mainly coming from mass movements most directly affected by the rising prices and loss of access to water that has accompanied water privatization in major cities in the global South. As a consequence, many contracts have been nullified and European firms have been kicked out (e.g., the Philippines, Ghana, Argentina, Bolivia). Nonetheless, I would argue that the greatest success of the World Bank over the past 60 years has not been its development projects – many of which have become disastrous – but its ability to create the space and legitimacy for global institutions of knowledge/power, generate experts and expertise, and their widespread use. Indeed, one cannot "legitimately" speak with authority on North-South relations *without* the use of World Bank data and analysis.

In this workshop, I would suggest we consider the genealogies and relational biographies of these new knowledge- and policy-producing institutes, organizations, eminent panels, NGOs, and educational programs popping up around the world, especially those promoting global sets of norms, rules of law, scientific protocols, technical expertise, and "global policy" advocacy. On the one hand, this realm is highly constrained by the neoliberal rationalities of their main financiers. On the other hand, it is a highly generative realm, producing new notions of "the public" that is supposedly "beyond politics," constitutive of the new "knowledge-based economy," and embedded in a growing "democratic" space called "global civil society." The one case I have just described has been created in a highly undemocratic fashion, and fueled largely by development capital, working strictly within the parameters of World Bank-style developmentalism. Yet, it has had far-reaching effects. This brief note recommends a strong research agenda that studies the empirical world of global expertise, global experts, global professional networks, the spaces and discourses in which their work has so successfully proliferated in such a short period of time.

Anna Guagnini

I think it appropriate to open my contribution by thanking the organizers of this seminar for the opportunity they are providing of exchanging views on the ways in which the history of science (in the broader meaning of history of science, technology and medicine) could be brought to bear on current debates at European Community level on science policy issues. It is particularly encouraging to see that a critical assessment of the assumptions on which policy decision are made, based on an historical perspective, is solicited by the European agencies; and there is no doubt that history of science can provide much needed assistance in

cies; and there is no doubt that history of science can provide much needed assistance in the analysis of such assumptions.

With regard to the agenda for the meeting, the pre-circulated document identifies thematic areas on which, over the past decades, research has been actively pursued, and suggests a broad range of directions which require further analysis and empirical investigation. I know I'm talking to the converts, but I am convinved that in most of those directions collaboration with other disciplines and sectors of historical inquiry – economic, business and law history – needs to be cultivated even more intensely than heretofore, also in view of the possibility of establishing a dialogue with science policy agencies.

Although the spectrum of subjects is already wide, there is another thematic area that, in my view, deserves to be addressed more systematically. Before suggesting it, and by way of preface, I would like to make a more general comment on the outline of the document. It seems to me that the three-partite framework in which the themes are cast ("Production", "Restriction" and "Regulation"), is strongly focussed on the problem of the control of knowledge, and in particular on the control over the uses of knowledge. There can be no question that the topics suggested under the headings "Restriction" and "Regulation" deserve to be thoroughly examined and discussed; after all, the theme of one of the research project in which I am currently involved with other European colleagues, namely the history of patenting, falls squarely within the scope of one of those areas[32]. However I think that, although capacious as a framework, the approach to other themes could be too narrow if they were to be considered as sub-headings of those three categories.

Such is the case, in particular, with regard the transmission and transfer of knowledge and science, their absorption and adaptation, and of the factors affecting these processes. Hence my suggestion is to make this cluster of problems the focus for a specific thematic area. Of course I am aware of the fact that these issues appear in the thematic areas already proposed: the problem of access to knowledge is among those identified under the heading "Restriction", and patents too are forms of information transfer. However the emphasis seems to rest mainly on an assessment of top-down constraints rather than on the analysis of the bottom-up aspect of access and on the conditions affecting the permeability and capability of different institutions and actors to assimilate and adapt knowledge[33]. I think also that it would be important to give more relief to the work that has been done, and continues to be done, on scientific education and instruction at all levels. An historical perspective on the transformation of this sector seems to me all the more important in view of the far reaching reforms that, over the past decade, have been adopted by most European countries. In consideration of the assumptions on which these reforms were based, and the criteria that were adopted, it can be certainly said that the agencies involved would have benefited from a "better understanding of the relations between science, society and politics" (I hope I'll be forgiven for the understatement).

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[32] "Patents in History: Studies in the Patterns and Institutions of Technological Change and Transfer", The 4-year project, coordinated by Ian Inkster, is supported British Academy grant; the countries involved are Britain, France, Germany, Italy, Norway and Spain. See A. Guagnini and Ian Inkster (eds.), *Patents in history*, special issue of *History of technology*, 24 (2002).

[33] In this respect, and with regard to the conditions affecting knowledge flows, I regard as very stimulating the arguments recently voiced by Giovanni Dosi, Patrick Llerena and Mauro Sylos Labini in "Science-Technology-Industry links and 'The European Paradox'. Some notes on the dynamics of scientific and technological research in Europe", *LEM working paper* 2005/02, Scuola Superiore S. Anna, Pisa.

Finally, I think that one of the tasks that needs to be addressed from an historical perspective is the relation between knowledge and information, and the semantic ambiguity with which the term knowledge is being used in such omnipresent (and undigested) expressions as knowledge-society and knowledge-economy.

Willem Halffman

1. Definitions of politics

In the introductory text to the workshop, the notion of science/knowledge is made problematic, while at the same time different aspects are identified (production, restriction, appropriation of knowledge). At risk of sounding pedantic, I do think it is important to note the various meanings of 'politics' or 'the political', as this will most likely lead to misunderstandings. Different connotations are embedded in specific research programmes, each with their own problematics, audiences, and ethos.

1. *Politics is what elected politicians do.* This is a narrow and proceduralist definition focusing on political *agendas*. "Political" is either contrasted with the issues that did not make it onto the agenda, i.e. the non-political or depoliticised. A contrast that is especially important to policy scientists is that between politics and *policy*, i.e. what the administration does: the production and implementation of plans to reach explicit goals. In this understanding, "science and politics" refers to issues such as the role of scientific knowledge in government decisions, the degree of scientific literacy of elected politicians, or the political (budget) support for technoscience or academia, or for specific programmes of research (nano, stem cell research, climate research).

2. *Politics is what pertains to the state or state-like structures.* Same principle as the previous definition, just casting the net wider. The main contrast is that between state and non state (one way to define public vs. non-public). The main difference with the previous meaning of politics is that now the science and knowledge of a wide range of public institutions enters the scope of investigation, such as risk regulation of executive agencies or science in public policies.

3. *Politics consists of the issues contested in the public sphere.* This definition comprises a wider procedural notion of what politics is, focusing on disagreement and contention. Evidently, it is also difficult and in itself even contended to identify what is and is not the public sphere. Similarly, what is and is not political in this sense can be highly contested, for example when issues are seen as 'depoliticised' into executive agencies or experts committees. In this sense, politics is not just something that occurs in Parliaments and town councils, but also on the streets, in the newspapers, or during the European Social Forum. Science and politics here refers to all that is contended about science, such as the debate on biotech risks, the growing concern about the military research in the European Union, or threats to civil liberties from new surveillance technologies – even if no state institutions are involved.

4. *Politics is concerned with the distribution of collective resources.* This is a more substantial definition, although also dependent on an (implicit) delimitation of what constitutes collective resources (and hence the collective). For such a notion, politics can occur in an organisation such as a university, as well as a country, a province, or even the entire world. Questions of science and politics primarily point to the distribution of knowledge as a collective resource, e.g. scientific literacy, innovative capacity, thematic priorities in science policy, the distribution of the limited research capacity between corporate

the distribution of the limited research capacity between corporate and non-corporate interests, etc.

5. *Politics is about collective decisions.* Similar to the previous one, but not restricted to resources. Hence, it focuses on what the collective should do, even if not subjected to widespread controversy or public debate. Science comes into the picture from two angles, either as a resource for decision making (the use of science in public policy, the selective creation of knowledge for public policy, dismissal of unwanted knowledge), or as the object of decisions (the regulation of animal testing, laboratory safety standards, the location of a new public university).

6. *Politics is all that affects the use and distribution of power.* Since power is distributed throughout society in various forms, even when this is not contested or made explicit, this means that the analyst can identify issues of "science and politics" even when they are not debated and not 'public'. In fact, one important reason to study these issues is to *make* them political, to make them an issue of public debate or even public policy. One example is the recent questioning of the universal validity of (DNA) fingerprinting, an issue that was largely un-political by the previous standards, but identified as of political relevance and subsequently brought into public debate.

7. *The political refers to the essential issues of the polis.* Such essential issues are, for example, the definition of 'the people' and how it should participate, or the definition of the public sphere and the action scope of the state, or the scope and conditions of political dissent and civil liberties (Held 1996). Typical issues for technoscience here involve privacy, or the possibilities of electronic democracy.

8. …

I want to point out that the issues of 'science and politics' become roughly wider as one moves down the list. The questions range from how politicians interact with science, to all issues related to (scientific) knowledge which affect the distribution of power in society – which is to say: just about everything. As systems theorists like to point out, science cannot delimit politics and politics cannot define science.

2. The policy bias of research on science and politics.

There is an increasing pressure on research to be 'relevant' or 'useful'. In the case of research on science and politics, this relevance is defined almost exclusively as policy relevance: the knowledge produced has to be of use to public policy of states and state-like institutions, including the European Commission. This in turn has made civil servants into a key (and is some cases the sole) audience of research on science and politics. Within the research on science and politics, specific research agendas have become dominant and along with it a dominant understanding of what is political about science. I'll describe some of what I see as the dominant research agendas.

A first agenda understands knowledge as an economic resource: technoscience is a reservoir of innovative capacity for economic growth. (The underlying assumption is that economic growth is an unproblematic good. It does not really matter what part of the economy grows, as long as increasing wealth is available to shore up the Pareto optimal pact that is the lynchpin of western economies: everybody benefits, although not in equal shares.) The political question is how to maximise the use of this resource at minimum cost. One such cost is public

tion is how to maximise the use of this resource at minimum cost. One such cost is public resistance, with biotechnology as the main icon. Research on science and politics is seen as useful and relevant if it reduces the cost of conflict, the 'contestation overhead' of innovation. Hence there are abundant funds for research on how to increase scientific literacy, based on the faulty assumption that the resistance overhead will decrease when people know more about technoscientific novelties. There are also abundant funds involving potential opponents of new technologies in their development, not to neutralise opposition (that usually fails anyway) but to take away the reasons for opposition through improvements in technological design. Similarly, there are also a lot of resources for research on regional innovation clusters, technology transfer, science-industry networks, etc.

A second research agenda is that of technoscience as a resource for collective goals, mainly involving public health and environmental protection. For example, there has been a lot of research on how technoscience can be mobilised for environmental protection, such as through programming of research, interactive technology assessment, 'transition management' etc. Especially interesting has been research on how to bring in non-traditional actors in research and innovation networks in these fields, such as small and medium enterprises, patient groups, environmental groups, or pioneer users.

A third agenda is that of the need of regulation of technoscience: where does the permanent revolution of innovation threaten to alter things that should not be altered? Here we find a large volume of research on risk regulation, but also on science and ethics. The research ranges from explorations of the ethical issues around new knowledge, such as in vitro fertilisation or genetic screening, to attempts at rule-based ethics, or research on how ethics committees work. Most of this research focuses on one area of research or risk and is usually organised around a national or at best comparative focus.
A fourth research agenda is that of the use of knowledge in public policy. How can scientific advice make its way to policy makers? How can policy makers make sure scientific advice is available when they need it, in a way that is both sufficiently independent and not unproductively critical of the ongoing policy work? (A lot of my own past research falls in this category.)

These elements of the research agenda have in common that they define relevant issues in science and politics along a shared understanding of 'the political', that is what public institutions do in the management of this collective resource of science. Along other definitions of the political, these research agendas are relatively innocuous and non-political, in that they generally aim to reduce rather than to increase contestation, or do not address political choices over how much resources should be allocated to what kind of research. In its most 'useful' form, this research actually runs the risk of becoming very subservient to pre-defined policy goals. (No major accusation intended – I have survived on this kind of funding for a long time.)

These research agendas have not come about by chance. They follow the needs of the most resourceful audience for research on 'science and politics': national state and supra-state organisations. This leads to a paradox: the workshop organisers ask for the gaps in knowledge and the interesting research questions for 'science and politics', but these gaps and questions may be precisely those that the main research financiers of this kind of research are not very keen to address and fund. Then again there are new avenues for ways in which this kind of research can inform politics, precisely in a wider sense of the term.

3. The underdeveloped research issues on science and politics.

So what are the questions about science and politics that get asked only rarely or not at all? The focus on the state and state-like structure of mainstream research on science and politics is understandable, since that is where (additional) funding can be found, but this means that salient developments have remained under-studied. Many of these operate on a trans- or international level.

1) The politics of science policy

A first set of questions relates to the international politics of science policy. Unfortunately, science policy research has become very subservient to policy makers and policy hypes. For the sake of a healthy research system, some distantiated reflection is urgent.

a) EU science policy and democracy

EU science policy is extremely complex and hard to trace, even for insiders. This raises questions about how science policy is set, who distributes funds, and on the basis of what kind of negotiations. Are these procedures responsive to concerns of EU citizens? Does not their Byzantine complexity itself impede a democratic debate, even if these procedures were designed to create consultation? What purposes does EU science serve and how to these relate to the roles that scientific reflection plays in a democracy?

b) Where do research policy priorities come from?

Research policy priorities are remarkably similar across countries: biotech, nanotech, genomics, the same buzz words return constantly. National and international research organisations claim to have an idea of the promising research trends of the future, for example through complex foresight exercises. At the same time, a lot of priorities are copied, research policy is sensitive to hypes, and extensive lobbies operate to launch the same programmes in different contexts, combining researchers and their clients. We know such dynamics exist, but there is little systematic and recent knowledge about them. What are strong coalitions in (European) science policy? Which research programmes get prioritised and (at least as important) what does not get researched? (I.e. ‘the production of non-knowledge’ as Hilgartner calls it.)

c) Science for innovation and innovation for growth

Innovation has become the mantra of research policy. This magic word forges an alliance between industry, research organisations, and researchers. Industry expects to see its competitive capacity shored up, research organisations find a new mission and reason to increase budgets, while researchers hope this will finally end the long term erosion of research budgets. What are the assumptions of the science-for-innovation logic? What does this mean for universities? What kind of research benefits from this logic and what kind of research gets pushed aside? What kind of economic activity is stimulated and what kind is not? What is meant by ‘innovation’ anyway?

2) The geopolitics of science

a) Technoscientific diplomacy

Scientists and academics have maintained international contacts even in situations where all dialogue seemed to have ended (e.g. in the Cold War). These connections have often formed the filaments around which diplomacy could grow again. At the same time, scientific cooperation agreements are often used by countries to stress cooperation or indicate rapprochement, even if it only concerns purely symbolic exchange of a few scientists. Very little is known about the diplomatic use of science and contacts between researchers, at least for recent times. For example: how intensive are international scientific exchange agreements? How symbolic are they? Do they lead to increased scientific cooperation or

How symbolic are they? Do they lead to increased scientific cooperation or closer diplomatic contacts?

b) The non-proliferation of (techno)science

Inversely, scientific knowledge is often also something that countries and corporations purposely do not want to share, keep under control. The dominant debate over such issues is cast in terms of global security (nuclear non-proliferation) or competition (breaking software monopolies). However, there are also questions about limitations to innovation capacity or global inequalities through limited access to technologies. There is growing concern that the patenting system, once devised to enable the free circulation of knowledge, is now being abused for hoarding knowledge. More research is needed on the effectiveness and legitimacy of restrictions on the distribution of knowledge, on alternative practices of patenting, and on ways in which governments can rethink their role in this.

c) The new global techno-scientific alliances

As the US implements an ever more restrictive immigration policy and undermines one of the key elements of its past geo-strategic success (i.e. its global brain drain), new alliances are formed. To some extent, Europe benefits from this development, in spite of the 'fortress Europe' attitude to non-EU citizens, but the position of China is especially interesting in this context, as its research system is booming. Europe and China are committed to closer cooperation in research. At the same time, Africa is a player of growing importance and a strategic partner for both China and Europe. How are such alliances shifting? Are the effects visible in indicators of cooperation, of numbers of foreign students? How does this affect the perspective of science policy makers, transnational industries, research organisations, even individual researchers? To what extent has the international 'brain flow' changed?

3) Science and security

a) The republic of science and security

Researchers – at least academic researchers – operate in an ethos of openness. Researchers can only get credit for discoveries if they can share them with others. In the past, questions have been raised about this free exchange of knowledge and the Cold War (Shills 1962). With the end of the cold war, the problem seemed to have faded, or was at least restricted to military and especially nuclear technologies. However, the problem has returned in the era of global fear of terrorism, for example in the context of biosecurity. Anti-terrorist administrations expect researchers to work under regimes of extreme restriction and security. How does this affect research? How does this affect access to knowledge, for example for developing countries?

b) The new security and the research system

Since the Second World War, the US research system has been heavily influenced by military research. In comparison, military research in Europe has been more limited and in some European countries even minimal. With attempts of Europe to 'catch up' in the global techno-science race, there are also renewed efforts to increase research on 'security', defined in terms of anti-terrorism. This raises new problems for political systems that have had little experience with major research programmes in 'security', especially in terms of democratic accountability. For example, smaller European countries have not had to deal with military research simply because they hardly did any. How is research policy responding to the new security issues? How is democratic accountability organised? How is 'security' defined and who defines it?

4) The distrust of academia

a) The measurement of science

In a recent article, Peter Weingart has pointed out some of the bizarre inadverted consequences of bibliometric output measurement of research (Weingart 2005). The pressure to produce as many international publications as possible is not only a nuisance to researchers, it also has consequences that range beyond the scientific work floor. More research is needed on how the ever more extreme output measurement regimes change research agendas (going for safe and easy research with guaranteed output), leads to a waste of collective resources (working on trivial publications), diverts academics away from societal debates (that do not happen to be on the international research agenda), and other undesirable effects.

b) The erosion of academic research

Bibliometric evaluation, but also the strong regime of contract research, has altered the position of academia in society. Universities are expected more and more to operate in a corporate model, with only elite institutions managing to maintain a strong academic independence. Academics are seen as an unreliable workforce that has to be monitored closely and cannot be trusted to work independently. This is part of a wider trend of mistrusting professionals, leading to regimes of increased measurement and control for professionals in, for example, health care or education.

Such developments have been especially painful for social sciences and humanities, which have become increasingly instrumentalised. The capacity of universities to radically reflect upon society and culture, to innovate and to question, has been gradually but radically undermined. How has the new management of research changed academia? How does a university in 2006 compare to a university in 1986? What is the role of academics in public debate now and how is it different from 1986, or from 1966? Is the growing industrialisation of (university) research really undermining its capacity for radical innovations and to what extent is growing fraud a problem (Krimsky 2003)?

5) Science and inequality

Science and inequality continues to be important issue in ways that have been studied in the past also: How is access to knowledge distributed in society and can this be made more diverse? (And EU initiatives for small and medium companies, supporting NGO research, science shops, etc.) How is participation in research careers distributed? (With women in science, but now also very important new issues for participation of non-western immigrants in research careers.) However, some questions deserve some extra attention, in my opinion:

a) The scientific publication system

There is an urgent need for research on the scientific publication system and how it distributes access to knowledge, especially for the developing world. Western researchers generally experience little restrictions in access to publications, especially because of electronic systems, but their library services know at what cost this free access comes. Some scientific publishers' publication policies verge on abuse of public funds. Science publishers also seem to stimulate the 'more is better' attitude of bibliometric evaluation. Most importantly, we need to make visible how this affects the global access to research.

b) The global distribution of technoscientific resources

How has the global distribution of technoscientific resources more generally shifted (patents, universities, researchers, publications,…)? Which developing countries are catching up? There is some evidence from the past decades that developing countries have set up science organisations to a large extent merely to mimic developed countries, or to conform to pressure

from international organisations (Drori, Meyer et al. 2003), but also that some developing countries are becoming active players in research (e.g. see the growth of the African Academy of Science).

c) Ethnicity and science
With tensions around immigration rising, ethnicity is back in research. Social scientists are taking a fresh look at migrants, but also in biology ethnicity is becoming a hot research topic again. How is ethnicity portrayed in sciences? How is it introduced in crime statistics, (preventive) health care, forensics, the biopolitics of the 21st century?

6) Trans-national research and democracy

a) International organisations
International organisations are important producers and providers of knowledge, especially for policy makers. There has been some (but not enough) research documenting research policy of international organisations such as the World Health Organisation (Oudshoorn 1997), or international research programmes. The conditions and terms of knowledge production in organisations such as OECD, IMF or World Bank have remained obscure. How are research agendas set in such organisations? How selective is the knowledge stock in which they build: what forms of knowledge are excluded? How is democratic accountability of such organisations organised, given the ephemeral nature of the global polity?

b) The regulation of research in a global research system
Ethical and social regulation of research has largely been organised on the basis of politics within the nation state: ethical committees, animal testing regulation, restrictions on human experiments, safety regulations, etc. In a global research setting, it seems increasingly easy to avoid such restrictions, e.g. through medical trials in developing countries, human cloning in Korea, or the re-location of animal testing. This raises questions of possibilities for global regulations of research practices to be ethically and socially responsible. Is there a global science without global governance of science?

7) New producers of knowledge

- NGO science
NGOs are becoming increasingly important producers of knowledge. Some NGOs are taking over critical roles that used to be performed by the university (e.g. the Amsterdam based Transnational Institute's research on global drug control policies). Some NGOs have found a niche in research that produces insufficient kudos for academics, but is nevertheless valuable enough to policy makers to sell, e.g. in biodiversity. Greenpeace operates its own research laboratory to provide counter-expertise. There is little overview of what roles NGOs are performing, what kind of knowledge they are producing, and how it relates to mainstream scientific knowledge production.

- Validation of non-institutional knowledge
Researchers validate knowledge in relatively firmly institutionalised contexts (research fields, journals, peer review systems). This raises the question of how research gets validated outside of such institutional contexts. The question is specifically important to do justice to indigenous and local knowledge.

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Volker Hess

Standards and Self-Willing.

It seems reasonable to claim that today we are living in the 'Era of Standards'. This tendency towards standardization goes beyond the uniformity of technical algorithms (http, etc.) and formats (DIN), however, to include definition of norms that govern our lives, including the implementation of binding patterns of behavior, informing all areas of modern life. Standardization is also a dominant feature in the worlds of knowledge and production, a characteristic that has developed over the last 150 years. Nevertheless, it is important to remember that standardization has always been and remains an essentially political issue.

Recent decades have witnessed the development of certain trends that point in a different direction and have confronted both political systems and society in general with new questions. European societies have seen the emergence of subgroups that define themselves in terms of distinct habits, ethnic origins, moral values or cultural behaviors. The logic of this trend culminates in equating identity with social and cultural individualization. In another context, industry and business have to face up to new demands for manufacturing products, such as the automobile, according to precise, individualized specifications, or producing tailor-made machine tools. In the life sciences, the genetic turn offers the promise of individualizing diversity, allowing analysis in terms of molecular epidemiology, the individual targeting of drug therapies, as well as the more detailed profiling of risk groups and evaluation of individual risk factors.

These latter tendencies do not fit so well into the historical picture that social studies and historiography have been framing over the last decades. Oriented towards explaining the 'era of standards' the analyses in both fields have focused on the normative and coercive aspects of these processes as their principle characteristics. In history, the enforcement of standards is often understood as the modern avatar of disciplinary regimes installed and sustained by and for a political authority. The social sciences analyze standardization as a key element in the process of 'normalization', an articulation of the overwhelming 'discourses of the normal' that represents an 'exclusively modern-occidental emergence' (Link). But it is not only recent trends that point to the limits of the favored analytical framework for understanding standardization. In recent years, historical studies have also noted some striking cases that run counter to the widely accepted master narratives. It seems to be time to develop another frame in which standardization could be interpreted as a process of 'society building' (in reference to the concept of 'nation building').

I would like to propose 'self-willing' (Lüdtke) as a central feature for shaping such an analytical framework. The concept originated in the context of the 'history of everyday life' to characterize the resistance that the 'little people' displayed when confronted with the constraints and demands of a disciplinary regime. 'Resistance' does not here mean 'reaction'

straints and demands of a disciplinary regime. ‘Resistance’ does not here mean ‘reaction’ in any physical sense but rather indicates an attitude to the standardization in question that ran counter to the normative expectations. Thus, the idea of ‘self-willing’ could be applied more widely to a whole range of studies involving standardization. Turning the historical perspective upside down and looking from the bottom up reveals very different ways in which standards and norms were negotiated on the ground. It also gives an insight into the room for maneuver created by the processes of standardization.

A good example is provided by the introduction of medical temperature measurement in the second half of the nineteenth century. This technology involved a triple standardization – in terms of corporal technique, biological nature, and social values. Thus, the measurement translated the patient’s subjective experience into an abstract number, and once the range of normal temperatures was defined, the measurement took on the role of providing a precise distinction between the status of normal or pathological. This technique established new ways of dealing with illness both inside and outside the hospital. Despite the loss of autonomy for the patient in terms of qualitative experience and the self-definition of illness, the standardization process introduced new room for maneuver into daily practice. Thus, it did not simply subject the passive patient’s body to the objectivity of an exact and precise measurement, it also armed the patient with the same objectivity that could be turned against those who had originally introduced it. Physicians could no longer legitimately suspect a worker of faking an illness if the temperature was above (or below) the accepted, normalized standard. Furthermore, the experts could no longer dispute an “abnormal temperature” once the instruments (and their use) had been standardized. In this way, the standardization served to arbitrate conflicting interests, obligations and values. It also legitimated claims to political and social equality by establishing a point of reference that was purportedly independent of economic and social status.

In conclusion, confronting standardization with ‘self-willing’ promises to open up a new analytical framework. Thus, we can interpret resistance and intractable behaviors that reject standards and norms as an inherent and perhaps necessary part of standardization. Indeed, this moment of resistance, I want to argue, is a recurrent historical phenomenon that, paradoxically, has helped to reinforce standardization as one of the main features of modern societies.

Nathalie Jas

The points raised result from my experience as a social and cultural historian of agricultural sciences. They are inspired by my current research project on health and environmental hazards related to pesticides in the XIX° and XX° centuries. This project develops comparative approaches and analyses different levels of action from very local to international ones.
In order to tackle the broad field of “Science and politics” and “Science and the political”, I shall deal more specifically with some aspects of the so-called “risk society”. My contention is that by showing how the emergence and shaping of some critical features of the “risk society” are embedded in long term “*trajectories*” (R. Kloppenburg’s concept), historical approaches help:
- re-evaluate the generally taken for granted “radical” novelty of the “risk society”;
- gain a better understanding of the current systems aiming at managing risks and which integrate political, economical, scientific, technological and social components.

I wish to make the three following points.

1) “History matters”

As many others of the same kind, the pesticides hazards dossier has a long history. It starts in the mid 1865’s when the first arsenical pesticides were introduced. By 1939, numerous local, national and international scientific and public controversies had already started to shape several of the tools used today to prevent pesticides related health and environmental hazards: product by product reasoning, registration with toxicity testing, uses restrictions for instance. The massive introduction of synthetic pesticides which started during the war had by the mid 1950’s, raised many of today crucial questions: chronic toxicity, interactions between substances, effects of excipients and adjuvants, stability of the pesticides in living organisms and the environment for instance. These questions were dealt with within pesticide hazard management systems put in place before the war. If the controversies of the 1950’s and 1960’s, and then of the 1970’s, 1980’s and 1990’s led to transformations of these systems, the latter are at the beginning of the XXIst century still deeply embedded in ways of thinking and doing shaped all over the XXth century and which have produced lasting *faits accomplis* and modes of action / reaction. History is therefore a critical determinant of current pesticides issues, as a result, require in depth analysis –as do many other “risk” existing dossiers.

2) From “hazard” to “risk”

Risk was originally an insurance concept and tool which eventually, during the two decades after 1945, supplanted other competing concepts and tools -especially these of “hazard”. Risk implies calculation, foreseeability, manageability. It works in tandem with the concept of “disaster”. “Risk” and “disaster” infer that we live in a world where great dangers are only potential and manageable (“risk”) or limited to intense but exceptional and circumscribed events (“disaster”). We only face dangers which might happen, which we are able to identify beforehand and manage. “Risk” is a far more reassuring concept than this of “hazard”. The success of the “risk” concept requires thoroughly historical inspection. Through which channels and how was it “naturalised”? Words always embody and stimulate certain ways of picturing, thinking and doing at the expense of other ways. The adoption of the “risk concept” and the construction of a “risk society” mean that certain ways of practically and conceptually dealing with menaces caused by the effects of human activities were chosen. As a result the history of the adoption of the “risk” concept should also be a history of the co-shaping of particular ways of thinking and doing in political, scientific, technological, economic and social spheres.

3) From the centrality of decision making to the centrality of practices and economy

The biggest part of the political and social sciences literature related to risk is about scientific expertises and regulations. What is interesting is to understand –and, if possible, to have an influence on- the role of scientific experts in policy making, how policies are shaped, and policy decisions taken. The most pressing crisis or controversies of the time are studied. However controversies are usually recurrent: a “risk” issue, once said politically, economically, scientifically, technologically, socially sorted out, comes back on the public scene again. Long term chronological, historical approaches therefore are needed in order to understand this recurrence. This implies to analyse how policies are –not- enforced, reach their goals or fail to. It means to study historically concrete practices within the scientific, political, administrative, economic, social spheres when it comes to deal with risk issues. My experience is that this focus soon draws the attention on the following facts: a) policy and concrete practices of regulation most of the times differ greatly; b) regulation –as it is usually assumed by the existing literature- is not the only –and probably not the most influential- mean of dealing with menaces caused by the effects of human activities. In both cases, factors

with menaces caused by the effects of human activities. In both cases, factors and actors belonging to the economic spheres are of utmost importance. As a result, there is an urgent need for historical "risk" studies focusing of the actual practices of the actors involved – within and out regulatory frameworks- and which place economical actors and their interests at the centre of the analysis –and not only or mostly scientists and policy makers.

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Cynthia Kraus

The Feminism Question in Science and Politics

It is no news that science is politics – and economics – by other means,[34]indeed a form of political economy[35]. In a systematic and quite exemplary manner, feminist scholars have analyzed the gendered politics of science, biology and medicine in particular – women's body and health, sexual difference all over the body, inside out, including the mind/brain, the so

[34] As an extension of Donna Haraway's claim that "Primatology is politics by other means" (1986 [1984]).
[35] See Gayle Rubin's « Notes on the 'Political Economy' of Sex » (1975). For a discussion of the notion of knowledge economy (see e.g. Foray 2001; Kraus 2005).

called sex hormones, contraception and procreation to name only a few controversial issues[36] – as another, yet powerful, way of doing gender and of sustaining heterosexuality as a political and knowledge regime ("the straight mind" as Monique Wittig would have it).

According to philosopher Sandra Harding (1986), the critical history of the field now known as feminist science studies began in the 1970s to question the exclusion of women from science and the androcentric/"bad science" resulting from their under-representation – she calls it the Woman Question in science. It then moved to interrogate the very standards of scientific investigation, the engendering practices at the core of scientific business – that's the Science Question in feminism. Interestingly, history has undergone, it seems, a similar evolution: feminist historians first asked if a women's history was at all possible (Perrot, 1984), before realizing that the women question challenged history as a scientific practice (Sohn et Thélamon, 1998).

In line with the workshop's bold invitation to develop a (new) historical perspective on science and politics, I would like to take the Science Question in feminism one step further: from the critique of "malestream/good science" to the constructive critique of feminism in that it is itself both science (think of women's and gender studies) and politics (resisting, acting on/in the social body) – what can be called here *The Feminism Question in science and in politics*.

Such a critique does not support the old and problematic idea of a feminist science. It does not only amount to ask if feminism has changed science (Schiebinger, 2000) or biomedicine (Löwy, 2005). As I see it now, the Feminism question is different in nature and larger in scope: it makes it possible to claim the *normative dimension of feminist science studies* (following on Latour, 1999) and to work for an in-depth transformation of knowledge practices in both the natural and social sciences, and the humanities, and to enforce real gender equality in society.

I hope that this tentative outline of The Feminism Question in science and politics meets the various interests of the workshop participants, and look forward to discuss this with you all.

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Emese Lafferton

I am interested in the relationship between science and 'diversity' (whether cultural- or biodiversity), and propose for consideration how social regulation through science needs to be culturally sensitive, whether at the local, the European or the global level.
To illuminate my point, I use examples from my own research areas in the history of medical and the social sciences in the decades around 1900, in particular: psychiatry in the Hungarian Kingdom. Consider, for instance, that practitioners of psychiatry in the given period took into account various social and biological aspects of a person when discussing liability to certain forms of mental illness. In this process, they simply rejected any potential influence of ethnic background in a country that was characterized by diverse cultural traditions and the richest multi-ethnic and multi-denominational social composition in contemporary Europe (hence the self-image in C19 Hungarian ethnography as "Europe in miniature"). The same blindness to ethnic origin is also manifest in the administrative management of large public lunatic asylums: every conceivable social and medical parameter of the patient was recorded at the time of admission, except for ethnicity.

Such a psychiatric organisation of the multi-ethnic patient population literally embodied the concept underlying the 1868 Nationalities Law, the product of the new form of governmentality established after the 1867 Compromise between Austria and Hungary.[37] This Law defined the political nation as Magyar, and secured individual civic rights to all citizens belonging to the Magyar polity, regardless of ethnic or nationality background (while, apart from some concessions, did not grant collective rights to the nationalities). The political drive behind the Law and subsequent state strategies was the goal of cultural and social assimilation of ethnic minorities which was seen as the only way to strengthen Magyar supremacy in the cultural and economic spheres as well as to keep the already shattering structure of the multi-ethnic Kingdom together. This necessitated assimilative and integrative, rather than stigmatising or exclusionary strategies, which is evident in psychiatric knowledge production and patient management (and similarly observable in other areas, like physical anthropology and ethnography). Such a psychiatric conceptualisation of the relationship between ethnicity and mental disorder, on the one hand, largely prevented a biologisation of ethnic difference and race, thus avoiding racist biological argumentation based on hierarchy and aiming at exclusion (which was widespread in many European scientific communities at the time). On the other hand, it denied the cultural and medical implications of ethnic diversity for psychiatry/medicine. One could hardly find a more striking historical example for the social regulation through science reflexive of a particular form of governmentality and perceived 'national interests'.

From a different perspective, the study of the history of psychiatric practices and therapies in Hungary in the long-C19 demonstrates the multiplicity of therapeutic cultures determined by regional differences in: medical traditions, infrastructure, the availability of expertise and its nature, socio-economic development, local cultural traditions, etc.

[37] The 1867 Compromise redefined the constitutional and economic relationship between the two countries.

To give just one example, consider the late-C19 therapeutic application of hypnosis. After two decades of intense research on hypnosis and its therapeutic application, neurologists in eminent academic clinics in the capital widely used it in their outpatient practice. Their only concern was professional demarcation through the ruthless denunciation of its lay practice. At the same time, asylum doctors in large public institutions (of far worse economic conditions and with a very different tradition in treatment and understanding of mental illness) harshly rejected its therapeutic use. While their explanation was purely professional and in line with the patient's interest (they stressed that hypnosis negatively affected an already unbalanced nervous system), the implementation of the time-consuming hypnotic therapy would have been simply impossible in these crowded institutions with only 4-5 doctors for a patient population of over 1000.

Again at the same time, far away from the capital's prestigious university psychiatric laboratories as well as in the lack of mental institutions, a provincial doctor in the vast stretches of the Kingdom could freely and successfully employ hypnosis in treating his patients from all segments of society. In the more lucrative practice involving aristocratic patients, hypnosis proved to be therapeutically effective, potentially due to the widespread culture of hypnotic and telepathic séances in this segment of society. The same provincial doctor could also efficiently employ hypnosis among his poor and peasant patients by admittedly and strategically relying on folk culture, local medical traditions and 'ethnic wisdom'. It could even be the case that this provincial doctor actually learnt the method of hypnotizing directly from a lay hypnotist so looked down upon by neurologists in the capital. Therefore, regional medical/scientific infrastructure and knowledge, as well as local customs and traditions deeply define what kind of a science/medicine may prevail in a certain geographic area as well as the forms of social regulation that are manifest in it.

The implications of my historical cases for the present are manifold:

1. The recognition that science as a powerful mode of social regulation is deeply framed by prevailing forms of governmentality, power relations, ideology, etc. Any science policy has to be self-reflexive of these processes.

2. The acknowledgement that scientific research, medical regimes and practices are deeply rooted in distinct cultural traditions and local social conditions. In this respect, the EU is far from being uniform. Although by now Western science/medicine has achieved a global form and is concerned, for instance, with threats of global pandemics and with the worldwide implementation of health and hygiene measures, in order for science to successfully control disease at the local and global levels, it is crucial to demonstrate a sensitivity for both cultural- and biodiversity.

3. On a different level, we have to recognise that there are also different cultural traditions of history of science/science studies, which inform in different ways how the interactions of science, society and power are envisaged in society. The state of the art of history of science in several new accession countries to the EU, namely the post-soviet regimes, is very different from that in former EU countries (which themselves demonstrate differences in this respect). This is evident in the relationship of science and the public as well as in the quality of historical work, the issues in focus, and the methodologies employed. For a more socially sensitive and politically aware approach to the relationship of science and politics in the united Europe, we need to transform history of science in these recently integrated countries by encouraging joint EU research projects, workshops, student exchanges, etc. Only this could achieve, in the long run, a more culturally perceptive and interdisciplinary approach to science in the academic field of these countries, which will have an impact on how science is

demic field of these countries, which will have an impact on how science is situated in contemporary European society and politics.

Julia Lajus

[Environmental] sciences and politics

The environment is made up of uncountable living and physical components linked by complex natural processes. Thus it is not astonishing that environmental sciences initially developed in the form of networks, and that some level of interdisciplinarity characterized them. The intricate functioning of these networks, shaped by contemporary national and global politics, and the institutionalization of these sciences are not fully understood. Knots in the networks, nexus points where new knowledge and scientific practices become apparent, are especially important. These knots often appear to be zones where different scientific practices or disciplines interact: the interaction between laboratory and field practices in biology, or between history and ecology in historical ecology/environmental history etc. More attention should be paid to the transfer of tacit knowledge and how it was shaped travelling from one scientific community to another.

Understanding that local knowledge is created in a particular context, within a framework of local practices and beliefs, is important. The crucial question is: how global scientific knowledge corresponded with local knowledge and practices. Historically, local knowledge often contradicted scientific knowledge and opposed a modernist faith in science. Scientific approaches to understanding natural resources changed from an initial understanding and respect for craftsmen's experiential knowledge to a modernist reliance on counting and managing resources, including humans. This change often led to the destruction of local knowledge systems and locally adapted skill sets. Moving people to new environments, both natural and social, resulted in their de-skilling, but also in awakening a predisposition to learn and accept scientific knowledge. This practice was widely used by colonial and totalitarian states. Today, rapid changes in modern societies, including the emergence of virtual spaces, probably have the same effects. Here, the role of universal recipes and instructions in the society vs. local knowledge increases, and science itself can be considered as a producer of recipes.
Contemporary environmental science and environmental politics encounter the problem of controversy between global and local values at every turn: for instance, the creation of national parks, a top priority for conservation and biodiversity studies, often clashes with the rights of local communities who do not value conservation. From the local viewpoint, the behavior of adversarial scientists and conservationists resembles that of former colonizers. From this broad perspective, studies of colonial science could be especially productive if they include the internal colonialism experienced by post-colonial and quasi-colonial states. The relationship between global and local are part of a political struggle for institutional hegemony by experts and their institutions.

The central question becomes – science as a tool of the political. What conditions encouraged or discouraged politicians to choose science as a tool, and scientists as allies? How did the pre-modern state based mostly on faith and tribute become the modern state based on science and socio-economical planning? How was the role of science transformed in the postmodern state, and how is it being transformed today? In spite of useful simplification, one cannot entirely reduce this question to the role of science as a tool of a state. Such "blackboxing" of the state, instead of understanding it as a multiplier of people's wills, is inadequate.

Environmental sciences in general are situated between two unpredictable realms: the natural and the political. Questions of power in the practice of science include power over nature – who should speak for nature? Who could and should be responsible for nature's constant, sometimes unpredictable, change? The unpredictability of politics might suggest a question of how robust science in general, and disciplines or institutions in particular, come under political pressure. More detailed studies of the Soviet/post-Soviet science could give some insights.
It is useful to look deeper at how political power and scientific power facilitate each other in controlling land and sea through exploration, surveying, mapping, etc., and how more sophisticated controls such as ecosystem-based management are currently implementing. Does the relatively new scientific practice of historicizing nature, shifting natural baselines backward through time, result in a more thorough consideration of human-induced environmental changes, and the respective growth of conservation politics?

The appropriation of knowledge through collective representation and collective memory is widely studied. However, the history of scientific outreach, for instance, through international exhibitions and World Fairs could be further developed to reveal the salient role of science and technology in shaping collective beliefs and in changing attitudes and values in particular disciplines.

In addition to the problems of restriction of access to knowledge, I propose examining resistance to knowledge within society in general as well as particular interest groups under different regimes of power. Many examples show that politically active groups accept and even adopt science easily, while oppressed groups and societies reject it. I traced this dichotomy in the study of Russian vs. Norwegian fishers. On the other hand, a Norwegian fishery science shaped by the current interests of politically powerful fisheries communities overlooked obvious environmental problems.

If several groups of scientists disagree about natural knowledge, current politics consciously or often unconsciously frames the choice between different systems and models. Several instructive case histories include the failure of regulation in the Canadian cod fisheries, the scientific and public debate over the "dearth of forests" in Germany, and many others.

The place of different mediators in the regulation of knowledge should be discussed. How did institutions that mediate between science and society develop historically in different regions/countries? What changed when boundary organizations that mix elements of science and politics emerged? What specific features distinguish European from US organizations? Are there common features in the transformation of science and its relations with society in countries coming into the EU?

Finally, it is very important to consider how science survives or develops outside the EU. Although there are many scientists in the states that formerly made up the Soviet Union, science as a system no longer works there. The role of science as a major contra-exceptionalist force in these societies is crucial, and needs to be better analyzed.

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Catherine Larrère

I would like to consider what Michel Serres (in *The Natural Contract*) calls the « settlement of the Galileo affair », that is the way the relationships between science and politics where settled in the modern era : a settlement about non-interfering in one another's business. Such a settlement, of course, never actually existed and, had it been formulated, it would have been a matter of relationships between religion and science rather than between politics and science. Actually, sicence and politics were not strictly separated in modern Europe, neither was science subordinated to politics. The French monarchy was strongly supportive of science, and considered that science could be a good basis for power, as the French politics towards China, in the 17th and 18th century shows.

If such a settlement ever existed, it can be found later, in 19th century Europe. Practically in the way the French Republic granted liberty in research to the French University, wanting to keep it free from the encroachments of economic power. A similar spirit can be found in Max Weber's famous lecture about « Wissenschaft als Beruf ».

The interesting point, in this lecture, is that Max Weber does not elaborate the facts/values dichotomy, which is at the center of his argument, on an epistemological level (which might have been a difficult point to contend) but draws an ethical duty from this dichotomy : the duty for the scientist not to call upon values in his scientifical work. This individual duty is transformed into a right, a collective one, in the 1930s, when scientists (through Popper, Polanyi or Merton) argue, against totalitarian power (Hitler's as well as Staline's), for the

lanyi or Merton) argue, against totalitarian power (Hitler's as well as Staline's), for the autonomy of science, the right for scientists for self-regulating their own work, without political interfering.

This autonomy is still strongly defended by scientists nowadays, as part of scientific freedom, and the independant relationships in a society formed of different semi-autonomous spheres or systems, have been advocated under the acronym NOMA (non-overlapping magisteries). But once more, as in the previous era, this is much more about keeping science apart from religious encroachments, than keeping it autonomous from politics. NOMA as been coined as an answer to the theory of the « intelligent design » a religious way of criticizing Darwin's Evolution theory.

Moreover, the relationships between science and politics can be understood in different way according to the (at least) twofold meanings of the word politics. Politics can refer to the goverment, the institutionalized way of ruling society, and, then, the relationship between science and government pertains to the domain of civil liberty, of the independance of civil society toward political government. But politics refers also to society as a whole, to the social community in its globality, and, then, the autonomy of science in the midst of society is much more difficult to argue. There are various reasons for that :

1)there is the question of the scientific community. The advocates of the autonomy of science, in the 30s, argued that science was a social community by itself, capable of self-regulation. But the actual scientific communities are not adequate to this somewhat ideal representation. They are both narrower (since the scientific world is divided in many smaller communities, which do not have so much communication to one another) and much larger : the obligation to publish, as well as the need to register patents draw scientists to address a much larger, and much more mixed audience than their own peers.

2)another reason (an obvious one) being that scientists no longer justify their work through the intrinsic value of science progress. They more and more refer to the practical and useful consequence of their works, therefore exposing themselves to social judgment about science. The meaning of scientific research (in physics as well as in biology) is now very strongly connected to the power the instrumentalization of this research is implying. And power is a very political matter indeed.

For all these reasons it would very interesting to study precisely the whole corean affair about the faked results in therapeutic cloning as the dream of an –allegedly- independant science (without any interfering political power or ethical restraining) turned into a nightmare. It would also be quite interesting to study this affair from the point of view of what ethical practices in scientific research are, or are not.

Margaret Lock

A call for the interrogation of naturalized concepts and practices of biomedicine

I will address the points for discussion a) with an emphasis on the biomedical sciences and related health care practices, b) on the basis of 30 years of anthropological research, c) drawing on experience as a member of several government appointed committees in Canada in connection with emerging biomedical technologies and d) as a member of the Canadian Institutes of Health Research Institute of Genetics institutional advisory board.

a) Production of knowledge

In technologically advanced societies knowledge in connection with the biosciences is produced primarily in the laboratory and almost without exception with the immediate objective of translating it into practices of direct use in the clinic. Increasingly the internet, the media, and direct-to-consumer advertising selectively inform the public, patient groups, and affected individuals and families about innovation and research findings. However, the process is not simply top down. In recent years pressure from interest groups, breast cancer and Alzheimer support groups; families with specific genetically inherited problems, mental health advocacy groups, and so on, directly influence research inquiry and knowledge production through political pressure applied primarily by means of government lobbying (see S. Blume and D. Porter). These activities can be divisive at times.

Great emphasis is given to the concept of risk in most contemporary health related knowledge dissemination. This in turn is linked to discourse about morals and responsibility. A perennial oscillating tension is evident since classical times in both Europe and Asia between individual responsibility for health and that of government for the health of its citizens. Biomedicine is associated primarily with an internalizing amoral discourse that has facilitated knowledge production and lessened stigma associated with many diseases. However, this reductionism has resulted in an excessively individualized approach to health and illness, skewed knowledge production away from social and political factors implicated in disease causation, and inappropriately alleviated government and industry of responsibility. It has also encouraged the expansion of an individualized bioethics.

The co-production of the material (biological) and the historical/cultural contributes to all forms of medical knowledge production and associated practices, temporarily and spatially. For example, even though the state of brain-death is widely recognized as a diagnosable neurological condition, it does not follow that this diagnosis is everywhere recognized as the end of human life, with enormous consequences for the transplant enterprise. A related matter is the need for an interrogation of the naturalized concepts and categories of biomedicine and bioethics in order to better comprehend the historical antecedents of knowledge production and its variations across geographical regions and specific countries. Among such concepts are the following: life, death, risk, health, autism, dementia, informed consent, autonomy, and so on.

Ethnographic research shows how the concept of culture is very often functions as a tool of nationalism in connection with health care provision and the production of population statistics. Culture is also mobilized to create discourse about the biopolitics of human difference and who, therefore, should be included in or excluded from effective health care. Legitimization or refutation of biomedical knowledge is also frequently accomplished by reference to presumed shared cultural and religious values, at times linked to willful ignorance (see also I. Löwy). The challenge of evolutionary biology by intelligent design is one such example.

b) Restriction

In theory all forms of biomedical knowledge are by definition for the good of society, but Nazi medicine and that of Japanese military doctors in China effectively ended an era of naivety. With the implementation of the Nuremburg Code at the end of World War II, human experimentation and drug development increasingly came under official scrutiny, with mixed results. The assumption was that oversight of research ethics would put an end to abuse, but ethical reviews boards have been only partially successful. Conflation of public and private research consortia accompanied by in-house reviews of bioethics by pharmaceutical and other companies has resulted in internal control of both knowledge production and its dissemination. As far as human experimentation and clinical trials are concerned, commencing with the Tuskegee experiments, continuing with numerous other abusive experiments conducted globally by medical researchers that were later documented by the

ally by medical researchers that were later documented by the British Medical Association, to present day clinical trials systematically being conducted in Africa and eastern Europe, secrecy about recruitment methods and restriction of knowledge dissemination are the norm. It is also well documented that negative findings in connection with drug trials are rarely published. Pharmaceutical and medical companies, basic scientists working in industry, and peer reviewers are primarily responsible for the restriction of information.

Three major fields of research activities are of particular concern today. The first is the procurement of human DNA and its storage as immortalized cell lines in DNA banks. Among the many problems associated with such banks, is that exploitation of isolated human populations is common in connection with DNA procurement. Second is genetic engineering, of plants, animals, and humans. The third is the emerging field of synthetic biology – the construction of unique and novel life forms, including viruses and other artificial microbes. This field is ostensibly concerned only with producing increased energy sources, climate change remediation and so on. However, despite the fact that the materials involved can be used in bio-warfare involved researchers declare that the only control needed over their research activities is a voluntary code of self-regulation. This assertion is presently being contested, and the development and control of recombinant DNA research discussed at length at Asilomar, California over 25 years ago is being revisited.

c) Regulation

Efforts to regulate the implementation of many of the new biomedical technologies, notably those that will clearly have extensive societal impact, are usually carried out these days in the form of commissions of inquiry, freqeuntly with input from relevant designated experts and members of the public. Results from surveys of public opinion on specific technologies are often incorporated into the hearings. Such commissions usually produce reports that include regulatory guidelines, but such reports do not necessarily lead to political action. Notable exceptions occur when an outright ban is called for on research considered downright dangerous or immoral, such as human cloning, or some aspects of body commodification. There is a reluctance to legislate in connection with the use of biomedical technologies because of an awareness of the speed with which technologies change, coupled with sensitivity about the time it takes to change the law, particularly criminal law.

Regulation varies widely from one country to another. There is in effect no regulation of assisted reproduction in the United States and sex selection, for example, can be performed legally in private clinics. Middle class citizens from China and India (where sex-selection is illegal) currently flock to several clinics in the US for prenatal genetic testing to achieve their desire for male children. Practices of regulation and restriction need to be understood as part of global systems of exchange (see also A. Sanal).

Because government funded research communities are increasingly obliged to partner with industry, it has become virtually impossible to regulate biomedical research and related practices, in part because industry has in-house ethics review boards that are rarely subject to public scrutiny. Moreover, intellectual property rights, notably patenting, restrict access of the global community of researchers to the basic materials needed for experimentation, making duplication of experiments difficult if not impossible.

Recent disclosures about the publication of research findings in medical journals that turn out to be fraudulent or flawed have made clear the limits of peer review as a reliable form of regulation. The political and economic interests of medical journals as well as their financial vulnerability is also apparent, as is the vulnerability of editors who, when they attempt to whistle blow, are fired by journal Boards. Many medical journals are today owned by private, for-profit companies, who control the journal advertising. Revenues from advertisements are usually indispensable to the continued success of such journals.

Although I strongly support public involvement at all levels of bioscience innovation, development, and implementation, I am equally concerned about who exactly speaks on behalf of various publics and designated groupings; above all, who speaks for the disenfranchised the world over. Second, while a focus on knowledge production and dissemination is of great importance, my position is that it is on the basis of an examination of practices that the relationship of science and the political is best understood.

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Ilana Löwy

Knowledge, ignorance and politics.

Last summer I went to the archive of the Presbyterian Hospital, NYC. I was instructed to go to the 25th floor, but at the hospital's reception desk I was told that the information I got was surely wrong: the building has only 23 floors. Finally somebody acknowledged that there is a 25th – and thus also 24th --floor, but the access to these floors is possible with a special elevator only. The 25th floor, small and cramped, hosted the archive. The 24th - - a regular hospital ward --was called "research unit", and, I was told, was destined for "invisible patients". In the 1980s, this floor hosted the central unit for the treatment of AIDS patients. At

1980s, this floor hosted the central unit for the treatment of AIDS patients. At that time, AIDS was at the centre of public controversy in the US and hospital administrators did not dare to admit that they are treating people seen as dangerous and abject.

The AIDS patients hidden in a "research unit" at heart of a huge modern hospital like "invisible" wards for respirator-dependent people, and spaces in paediatric hospitals that harbour handicapped and unwanted children display the co-production of knowledge and ignorance.[38] But the production of ignorance is not limited to hidden places and (relatively) marginal issues. This topic is central to understanding of production, regulation and uses of knowledge in society. In their pioneering work, *Sociology of Ignorance*, Amos Funkenstain and Adin Steinsaltz propose that ignorance is actively produced and disseminated alongside with knowledge, and that both are equally labour intensive and costly endeavours.[39] They discuss several mechanisms that produce ignorance. One key mechanism is the institutionalisation of Western science. From the Renaissance on, only knowledge produced by qualified persons (until recently, white, upper-class men) in specific institutions (universities, academies, research institutes) is seen as legitimate, a process that automatically classified knowledge produced outside institutional frameworks, and /or by other social groups such as women, "natives" in colonies, lower classes, as ignorance. [40] Another mechanism is restriction of diffusion of results of investigations. Secret military or industrial research –today a monumental enterprise -- produces ignorance indirectly, by hiding knowledge, and directly, through deliberate dissemination of dis-information.[41] Ignorance can be also produced by artificially fabricating complexity and presenting evidence (e.g., on links between tobacco and lung cancer, or global warming) as controversial and uncertain, by avoidance of specific issues, by their definition as irrelevant or uninteresting, and by blurring distinctions between signal and noise. The latter may result from superficial popularization that replaces efforts to explain how science works with tales about "miracles of science", an "overload" of information, or scare politics. Scare and indignation, as the history of epidemics shows, are volatile tools: they can stimulate the production of knowledge, but also of ignorance.[42]

The history of AIDS can illustrate the dangers of production and dissemination of ignorance. There are two very different AIDS stories. The first is an exemplary tale of intersection between science and civil society. AIDS activists successfully challenged the rules of testing of new antiviral compounds. [43] They also changed AIDS's image. In the 1980s, AIDS-- a disease that linked sex, blood, drugs and the rejection of darker "others"--crystallized fears and suspicions.[44] The patients hidden at the "inexistent" 24th floor were victims of intense campaign of dissemination of ignorance. Such campaign does not exist anymore. In today's NYC, AIDS is not a shameful and frightening disease, but a treatable and controllable infection.

There is, however, a very different story of AIDS, the one of a tragic failure of an alliance between science and politics. In the late 1980s epidemiological projections made by experts such as Nathan Clumeck from Brussels clearly indicated that without immediate steps to halt contagion sub-Saharan Africa would face an unprecedented health disaster. No such steps were taken and the disaster happened as predicted.[45] The inaction of public health experts and politicians is explained by general causes such as priorities established by the hegemonic neo –liberal policies, the loss of Western interest in AIDS epidemics once it became clear that it

[38] Kaufman, 2005, Weiss, 2002.
[39] Funkenstein & Steinsaltz, 1987.
[40] Schiebinger, 1989, Jacobus, Fox-Keller & Shuttleworth, 1990, Vaughan, 1991; Arnold, 2000.
[41] Galison, 2004.
[42] Rosenberg, 1962, Evans 1987.
[43] Epstein 1996, Barbot 2002.
[44] Farmer, 1992, Treichler, 1999.
[45] Fassin, 2006.

does not threaten developed countries, or the collapse of state structures in Africa. Global effects are, however, mediated by specific mechanisms. One such mechanism was the dismantlement of WHO's AIDS Task Force in 1990, and the parallel sharp reduction in international spending on this issue. In a critical moment in the epidemic's history, public health authorities probably missed an opportunity to prevent an exponential spread of AIDS.[46] The 1990s decrease in spending on AIDS in Africa was facilitated by the public's "fatigue" with an overload of contradictory AIDS news, and by the (mostly rhetoric) argument that money emplyed to prevent AIDS will be better used for fight against more prevalent diseases such as malaria. In early 1990s, the production of ignorance about AIDS might have had overweighed the production of knowledge, a short-time dysfunction with dramatic long-term consequences.

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Michelle Murphy

Mapping the intersecting domains of “science” and “politics” requires not only historical investigation into the scope of practices which historically have gone under these two terms, but also theorizing these domains strategically and provisionally as conceptual entry points. What counts as “science,” what sites and activities are named in its compass, and what counts

[46] Fee, 2005.

as “politics,” where is politics understood to reside, are questions that point to the contestable historical ontology of both terms in the past and present. A genealogical project of the intersection of science and politics might help push inquiry past questions of old and new, and towards the questions oftangled productions raised in this projects introductory proposal. Some of the problematics I see as important to this project are:

1) How is science animated and generative of transnational processes such as colonialism, diasporas, economic relations, militarism, supranational governance, imperialism, global finance and other circuits that are not confined to the scale of the nation-state? Attending to transnsnational frames helps us trace histories of “science” and “politics” that do not assume the nation-state as the necessary unit of reference and, moreover, are useful for prompting questions about what sites, scales, and practices are included as part of “politics.” Attending to science as constitutive of transnational processes encourages scholarship that draws out not only the local shape of scientific practices, but also the geographically disparate connections and disconnections that scientific practices participate in.

2) How is “science” an integral part of past and present methods of governance, by states, by supranational organizations, by corporations, by communities, by NGOs, and so on. How might we map the tangled and dispersed ways in which scientific practices have become part of methods of governance? If we understand science capaciously, including within it a wide range of practices and lay actors removed from laboratories or clinics, how does this multiply the ways science is part of political practice?

2) What emergent forms of life are becoming and have become preoccupations of scientific inquiries and governmental institutions? How have gender and race, for example, become categories of rule in development projects, structural adjustment programs, global public health, or debt financing at the same time that they have been largely evacuated of a biological materiality? How might we track the “ontological politics” of science, or of formations of capital? As practices of global capital not only commodifies living-being but calls forth new forms of life, questions of economy, both as a discipline but also a set of relations should gain new prominence in the field of history of science and STS.

Paolo Palladino

Science as the pursuit of politics by other means?

In considering the relationship between science and the political from a specifically historical perspective, it is critically important to examine the extent to which, when those in the field of science and technology studies today seek to contest the authority of technocratic institutions by speaking of science being the pursuit of politics by other means, their concern is in fact not about the future of politics, but about the future of governance in an increasingly techno-scientific culture.

Canonically, the phrase ‘the political’ marks out a discursive domain concerning life with others, orientated toward a distinct goal, namely the realisation of the unity of the ‘one and the many’. How this unity is to be actualised is, of course, contested, and the name of such contestation is ‘politics’. As Jacques Rancière (2001) has noted, however, ever since Plato and Aristotle, philosophy has sought to establish an understanding of the political sphere which holds out the promise that the contestation might be resolved rationally, despite the fundamental incommensurability of philosophical reflection and political engagement. Paolo Palladino and Tiago Moreira (2006) have recently sought to explore some implications of Rancière’s understanding of the political for the field of science and technology studies (see

cière's understanding of the political for the field of science and technology studies (see also Bennett, 2005). Science arguably is the heir to philosophy, insofar as it seeks to establish incontrovertible, rational principles whereby one is to understand and act in an empirically determinable, material world, this material world being all that there is. As Bruno Latour (1991) argued long ago, *contra* Steven Shapin and Simon Schaffer's *Leviathan and the Air-Pump* (1985), the emergence of this enterprise has coincided with the evolution of modern theories of sovereignty and, despite all their historical differences, each is entangled in the constitution and legitimation of the other. This has some important implications for how the relationship between science and the political is today being configured by those who would advance a more democratic techno-scientific culture. One should note, for example, that the notion of 'democracy', which Latour mobilises to imagine a 'new constitution' that would undo the contemporary technocratic order, is heir to the very same modern theories of sovereignty enabling the division of power and knowledge. To be more precise, it is a well rehearsed argument within the field of science and technology studies that science, as a historically specific set of institutions, and democracy are incompatible, principally because these scientific institutions are publicly construed as establishing incontrovertible truths about the material world, to which political institutions must then adapt. This unaccountability of scientific institutions, this location of science outside the political domain, has, of course, been challenged, both practically and conceptually. Practically, the challenge has resulted in an expansion of the range of actors involved in the further evolution of these scientific institutions. Mirroring attempts to expand democratic accountability in other spheres of civic life, the principle of 'participation' is today increasingly being extended to science, but, as Michel Callon and Vololona Rabeharisoa (2004) rightly recognise, this principle raises difficult questions about entitlement to participation (see also Callon, Lascoumes & Barthe, 2001). The reservation Palladino and Moreira articulate with respect to Callon and Rabeharisoa's answer is that, in seeking alternative modes of counting that might expand entitlement to participation, even to include non-human actors, the very notion of 'participation' and its relationship to 'democracy', understood here as the unity of the 'one and the many', remains uninterrogated. There are good onto-political reasons to call for an interrogation of this relationship. As Nikolas Rose (1999) has said of contemporary politics:

> The citizen as consumer is to become an active agent in the regulation of professional expertise. The citizen as prudent is to become an active agent in the provision of security. The citizen as employee is to become an active agent in the regeneration of industry and as consumer is to be an agent for innovation, quality and competitiveness ... This kind of 'government through freedom' multiplies the points at which the citizen has to play his or her part in the games that govern him (166).

While this understanding of 'participation' and 'democracy' is consistent with Latour and Callon's perspectives on contemporary techno-scientific culture, the internalisation of liberal governance rests on the redefinition of politics as 'governmentality', the administration of evermore atomised units of account, based on the assumption that the totality in no more than the sum of its empirically determinable parts. When the governmental apparatus fails, the failure then is one of calculation, rather than a problem with the very notion of calculation inherited from contractual theories of governance, from Hobbesian 'political arithmetick'. What this understanding, shared today by actor and critic alike, fails to confront is Michel Foucault's observation about the human sciences that:

> Man has not been able to describe himself as a configuration in an *episteme* without thought at the same time discovering, both in itself and outside itself, at its borders yet also in its very warp and woof, an element of darkness, an apparently

inert density in which it is embedded … (Foucault, 1994: 326; see also Heidegger, 1977).

There are, of course, problems to Foucault's formulation of the issue, chiefly his tacit, neo-Kantian evocation of an original plenitude. As Palladino and Moreira have suggested, however, the task for a field of science and technology studies that would take the political seriously none the less is to begin to explore the production of this 'element of darkness', this constitutive element produced by all historical attempts to determine the structure and operation of political collectives.

In sum, when those in the field of science and technology studies speak of science being the pursuit of politics by other means and then seek to ensure that it is the pursuit of a democratic politics, there is something of a tautology at work, which deserves closer inspection.

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John Pickstone

a) Notes on Communicative and Instrumental Rationalities in medicine

There are many good reasons for approaching questions of scientific expertise through the history of medicine. Not least, it offers us a way around what I call the Single-Science-Formation (SSF): the view that all proper sciences shared a method, could be arranged in a hierarchy and were best practised and understood in universities; that science was essentially research, and that technologies, including medicine, were applied science. History of Medicine, read broadly, can help provide alternative views, rooted in the variety of everyday practices across the globe (as well including innovations and research).

Here I take one key point – that some aspects of medicine are paradigmatic for what I will call, loosely following Habermas, communicative rationality, and others for key components

of modern instrumental rationality. For the former I shall discuss 'biographical medicine' eg discussion between an informed patient and a sympathetic doctor; the latter include the recent capacity to evaluate the effects of medical technologies beyond their market relations, ie to get some estimate of the public good.

The model of 'biographical medicine,' which has proved useful for history, also offers an ideal for present uses of expertise. In this model, disease is understood as a disturbance of life, not just at the level of natural history but in terms of life-goals and meaning; the patient is the patron of the doctor (or, in more recent political theory, the patient stands as principal to agent). The doctor maybe said to be expert on the general 'nature' of the patient and disease, the patient on particulars and goals. The model is best known for classical medicine and for 18c upper class practice, but it retains relevance, not just for the medicine of the rich but re the massive increase in counselling over recent decades, and for the active involvement of patients who, individually and in groups, are informed via books and the internet about the biographies of fellow sufferers -- to the extent that some patient groups have profitably acted as patrons of medical research. 'Biographical medicine' uses, but subordinates, the analytic and instrumental; the model points us to the political dimensions of medicine; patients are not just consumers, choice should not be reduced to markets. The same model can be used for other technologies and other aspects of the world around us. (Consider, say, environmentalism, or people's relations to the new genetics).

But this view of medicine stands in tension with that based on analysis and rationalisation -- from the post Revolutionary Parisian clinics and claims for universal sciences of disease, to the cumulation of analytical methods in hospital laboratories through to the present; to the growth of statistical method for evaluating therapies etc; and to the extension of experimental intervention and of novel remedies from academic labs to clinics, and from company to pharmacy. These knowledge-practices constituted the clinical sciences which boosted teaching hospitals, and the preclinical disciplines (often linked with physical sciences) often led by non-clinical scientists who drew research funding from governments and large philanthropists. These various knowledge-practices helped create new authority for doctors, and influence for medical researchers. Patients, at worst, were the unknowing objects of research, more often the grateful recipients of its products, especially when the majority of western countries ensured public access to technical medicine. Critiques of technical fixes and of specialisation continued to be developed, often from a biographical standpoint, but Science, professional power and state health care grew together til the 1960s.

The subsequent critiques of the state, Science and the professions, from the left and then from neoliberals, together with a certain democratisation of knowledge, and world wide attempts to stem the rising costs of insurance medicine, have radically changed medicine since the 1980s. In most western countries, medicine is increasingly managed, and in detail, by the state or insurance agencies. Technical analysis is extended from diagnostic classifications to the cost effectiveness of procedures, and the resultant power is exercised over doctors rather than by them; economics becomes the privileged science. The key political question, for doctors and for patients, as around some other eras of rationalisation, is how biographical and communicative approaches can make use of the new analyses, rather than being dominated by them. How claims re the good of patients and of publics (which are not always the same) can be asserted against the claims of insurance agencies, government departments, commercial companies, and professional groupings – all with their particular instrumental rationalities.

Social-democratic medicine has much to offer for wider discussions of expertise and its uses: from wide access to the benefits of science via welfare states, to modern technical and ethical committees which can assess the cost-benefits of new technologies or usefully depoliticise

nature-meaning issues, eg around embryos. Further, the model of government (at various levels) as setting agendas for technical agencies and companies, is interesting; it might be extended to pharmaceuticals or other high tech manufacturing, now that most of the components of drug design and development can be 'bought in' independently of the large companies. That medical research policy too is increasingly directed towards health services rather than scientists' peer preferences (eg to the support of trials), is also suggestive (if risking short-termism).

The increasing openness and public accountability of professional knowledge is to be welcomed, but the accompanying corporatisation (which includes the public sector) may be dangerous, especially if the role of professionals (and lay 'governors') as independent advocates for patients and for publics is thereby compromised.

b) The rule of ignorance: A polemic on history, medicine and health-service policy

A friend of mine studies the history of public health in the later 18th and early 19th centuries. He looks at big civil engineering schemes, and he's been asking himself about risk and trust (which are hot topics in social studies of science). Who could one trust when thinking of investing in a major engineering project?

One answer, particularly popular in the eighteenth century was this -- 'Trust men who have themselves invested'. Their money had followed their mouths, you could follow where they led; I guess this solution resonates still, as in -- trust the private sector to do justice to their investment. Trust men who mean business, and scientists who are rich from spin-off companies. Perhaps this argument, in principle, has been weaker since the mid 19th century when owners were no longer liable for the debts of their public companies; but it still has power.
But the characteristic Victorian answer was rather different. Men with a direct interest may be misleading others to protect and enrich themselves, and especially if they are not personally liable. So if you want a reliable judgement, get an expert. Here they were using what was essentially a new social device. 'Experts' in a sense, had barely existed in the 18th century, but by the mid 19th century there were national organisations of doctors and engineers, developing training programmes, formal qualifications and codes of ethics, keeping lists of the qualified, and threatening miscreants with exclusion. They were, as the poet Coleridge recognised, a new equivalent of the clergy, but guaranteed by training rather than family or calling. They were the new professionals, and if you needed unbiased, informed judgements, they were surely your men.

And so it continued until about 1980. Experts got more powerful and they got better at being experts. Doctors, for example, essentially directed the NHS after World War Two because they knew which procedures (and people) were reliable, and what new methods deserved to be introduced. From the 1950s, they made increasing use of randomised controlled trials – clinical experiments to assess the safety and efficacy of new medicines. And since the 1980s, Britain has helped lead a world-wide movement to test old procedures as well as new. For much of medicine, but by no means all, there are now accessible statistics on the relative worth of remedies. Of course, that does not solve all the problems of medicine, because patients are infinitely complicated, and the following of rules may inhibit judgement as well as support it -- but the data-bank helps, and the scope has now expended to cover economics as well as clinical effects. The (British) National Institute for Clinical Excellence is now world renowned and much respected; it assesses cost-benefit as well as safety and efficacy; it seems a natural complement to a National Health Service seeking efficiency grounded in secure public judgements.

Part of the reassurance comes from the fact that such bodies increasingly include lay representatives as well as professional scientists. They have widened their membership to represent the public, in some sense, but they still manage to produce some consensus. Here too, in public respect for lay views, we might claim progress.

Before about 1970, doctors took decisions in the interests of their patients, and the patient did not need to know. Now, as a patient, you have to give permission before operations, and for any kind of research involvement, if not for other kinds of treatment. The doctor has to ensure you understand what is going on. This principle can have some funny outcomes, but few would reject it.

So combining these two recent outcomes we have some cause for public satisfaction. Before any major new procedure can be introduced into the NHS, it has to be very carefully tested and assessed, including comparisons with present practice. Before any experimental procedure is used on you, you must consent and your consent must be informed.

But consider now the authorities who design and re-design medical services -- the people who organise and reorganise the NHS. The new procedures are often exceedingly expensive and they may make significant differences to clinical outcomes. They usually affect a high proportion of the country's sick – far more than receive any particular kind of medicine. Do those procedures have to be tested? Is there an expert and lay body which weighs the need for change, and the merit of rival proposals, or which conducts experiments with published results so we can all see what happened? Well no -- there is no such body, and next to no such process.

Re-organisation of the English NHS is now endemic, hectic and essentially out of control. Most MPs do not understand, for example, the recent move to patient-based commissioning and the newspapers find it far too complicated. It is probably fair to say that nowhere in Britain is there a thorough public account of the reasons for which it was introduced, the statistics and experiments on which judgements were made, or the measures by which it will be assessed. There was little testing, and little attempt to justify the shift by experience elsewhere.
One might possibly justify such political processes if they were voluntary – if local bodies or professional groups were asked for informed consent. But there is no more consent than there is evidence. Health professionals are honour bound to respect patients, but governments regularly over-ride the judgements of these same professionals about their own best modes of work etc.

This is not just a matter of degraded political practice, for the consequences of this mode of decisions are plain, painful and expensive. For example, the structures now being created for the NHS are rather similar to those which the Labour government inherited and attacked in 1997. In the decade since 1997, NHS staff have endured several major and many minor re-organisations[47]. Clinicians have suffered disruptions and uncertainties, thousands of managers have spent their time (and your money) anticipating or following up on 'initiatives'. To excuse this hugely costly circuit as a means by which labour politicians were educated would seem absurdly charitable, even assuming that we are now making progress. There was never time to assess any of the changes, nor was there any reason to expect any new

[47] For the recent history of the NHS the best source is Rudolf Klein (2006), *The New Politics of the NHS. From Creation to Reinvention*, Radcliffe Publishing, Oxford.

arrangements to last. Much of the service worked in a crazy-space of constant change and little judgement – or rather, most of the staff tried to get on with the serious work whilst the super-structure whirled expensively and dangerously around them. And so it goes on – except that commercial contracts are harder to revise than public arrangements, so we will be tied into private sector schemes whether they work or not.

I do not mean to say that nothing improved. The extra money was exceedingly welcome. Britain's health expenditure is getting back to the levels one would expect from European comparisons, and though many 'attainments' are artefacts of the target and accounting systems, some services were certainly improved, often by linking expert clinicians with managers skilled in facilitating change. But that could have happened without endless re-organisations. The structures of the 1980s could have delivered those results – with much lower administrative costs, let alone the added costs of the brainless changes.

Why then has the NHS suffered so? Why, when so much has been spent, has the general confidence of public services been so undermined? Why do professionals and the public-spirited so despair of how a Labour government has handled the great services of a Nation? Why, for the first time, after expenditure without precedent, is Labour less trusted than the Conservatives as guardians of the NHS?

Let's go back to the Georgian inventors (who had liability but little expertise) and the Victorian professionals (whose liability was to their long-term professional reputations, but whose personal involvement was slight); and let's ask how one might variously combine the roles. You might have both expertise and involvement – for example, you might be a clinician helping reform a cancer service in which you worked. You know what needs doing and you can convince your fellows – locally and then maybe nationally. As far as I can see, that is the model which has in fact worked.

Or you could have the other combination – little involvement and little expertise. That was a combination once characteristic of medicine, especially in the Georgian period. Doctors who sold cure-alls, or did dangerous operations, were commonly itinerants; when the bandages came off and the pathological chickens came home to roost, the 'doctor' had left town. But why then did patients use them, or why did rich patients pay their guineas to physicians whose remedies had no more than surface plausibility?

It was because human beings, like health services, are complicated and it is hard to assess what works; so a few successful cases might be persuasive, whatever the (unseen) overall results. It was because patients and their carers, and their physicians, were desperate for <u>something</u> to be done, and paying out large sums showed you cared – you had done your best and no-one could deny it. It was because simplistic arguments proved persuasive when backed with social authority and a veneer of 'science,' even when there was little feed back or evidence. Such were and are the conditions of what was technically known as quackery, or to be more specific, of medical dogmatism – the assumption that from first principles you could prescribe what the patient body needed, so there was little need to worry about 'mere empiricism.' And such are the conditions of health-service politics in Britain now. Health system reform is a free field for quackery.

Who then are the quacks? Who prescribes the changes in services? Who charges a fortune for diagnostic abilities and prescriptive acumen for which there is no history or evidence? Who has the social clout to be invited in, over the heads of the local clinicians? Who commands the faith of the hopeful ignorant, and what are the claims of this new kind of 'expertise'?

You can feel all around you the social power of the faith. If you work in a University, for example, you will see teaching assessment programmes, human resources policies, or internal communication systems, brought in at great cost. They do not work well, sometimes they hardly work at all, but the leaders of institutions have faith, because their paymasters have faith, and their business colleagues have faith in these routines and experts. The possibilities of shared delusions are great, and they bring us back to the Georgians. But how can they persist in an age where many kinds of professionals know both how to assess remedies and to respect the recipients?

One reason, and it does no credit to academics, is that few of us have taken the trouble to describe, still less assess, the costs and outcomes of the consultancies and associated forms of public management. There is some good work on 'audit,'[48] and some case studies of consultant-led change, eg at the BBC.[49] Christopher Pollitt has recently analysed what he calls 'institutional amnesia in the age of information' – the lack of corporate memory, and of attention to past records, the systematic failure use experience[50]. There is excellent new work on the consequences of IMF/World Bank experiments favouring the privatisation of utilities in developing countries[51]. And the sociologist Richard Sennett has surveyed some of the relevant material and has underlined the future-orientation of much of the culture of modern management. This orientation demotes memory and experience, it promotes plausibility based on first principles rather than evidence – and so we come back to what in medicine was called dogmatism.

But another part of the problem, around modern consultancies as around 18th century medicine, involves simplistic views about the nature of knowledge and its relation to practice. The problematic of many dogmatic doctors was clear: understand the first principles of the body and work out the cures thereby. There were then rather a lot of plausible first principles – you could focus on blood vessels, or the gut, or the nerves; you could attribute disease to blockage or excessive flow, or to insufficiency or excess; sage doctors wrote rival pamphlets to peddle their philosophies for managing the body. Everyone was interested in bodies, and the language was accessible for all its technical veneer; the books were discussed in coffee houses and magazines for gentlemen. They would have sold well in modern airports, somewhere between the self-help books, the sex guides and the management pot-boilers. In all these areas of perennial concern, common problems are met with fashionable answers, and if you don't like one fashion, another will be along soon. But what then happened to save medicine from professional quackery and dogmatism, and why has it not happened in management and consultancies?

To summarise for medicine– some doctors came to focus less on remedies and more on careful analysis of body function. There followed a period of therapeutic scepticism in which, among elite practitioners, heroic remedies fell out of favour. The best doctors no longer bled by the pints nor purged by the pot-full, instead they focussed on the healing powers of the body and on gentle remedies. They collected case histories, both for diagnosis and for therapy. They learned how to analyse living functions, and they refined classifications of

[48] For example, Marilyn Strathern, ed, (2000), *Audit Cultures: Anthropological Studies in Accountability, Ethics and the Academy*, EASA series in Social Anthropology, London: Routledge.
[49] See Richard Sennett (2005), The Culture of the New Capitalism, Yale University Press
[50] Christopher Pollitt (2000), 'Institutional amnesia: a paradox. of the 'information age'. *Prometheus*, 18, 1, pp. 5–16.
51 Michael Goldman (2005), *Imperial Nature: The World Bank and Struggles for Social Justice in the Age of Globalization*, Yale University Press.

pathology. They began to collect statistics on remedies, and to conduct experiments which were carefully controlled to isolate the causes of a given effect. Much of the work was done on animals, and then extended to patients; but some, it must be admitted, was done on patients, and not always with consent, for as we have discussed already, much of the refinement in clinical medicine was the product of the later twentieth century. But hopefully you can now see how these 19th and 20th century stories were connected.

What then of management sciences? Not much is written on their histories, but we can sew together a rough guide (and hope that more sophisticated histories will be forthcoming). Experts on management, one might say, appeared around 1900, but there were of course various earlier forms of teaching and commentary, especially around the development of industry over the 19th century. At the start of Victoria's reign you could find books on the natural history of industry, and lots of encyclopedia articles detailing new kinds of machine. Some of the books mixed-in some political economy, and the resulting mix was sometime called 'philosophy of industry'. The economics came in various kinds, but it was largely the British political economy of Smith, Malthus and Ricardo, based on simple principles. It is not obvious that the new science made much difference to the how business men operated, but it did most beautifully legitimate their behaviour. Poverty wages were a natural result of supply and demand; working-men worked only from the threat of destitution. But sometimes you would find an industrialist with the gentler wisdom confirmed by later experience -- for example, one Manchester mill owner, though perhaps not true to type, argued that workers should be maintained through bad times lest they became depressed by helpless poverty and lost the aspirations which were the real source of their industry and constructive social actions.

That sort of approach, based on observation rather than first principles was commoner in the so called historicist school based in Germany, but also represented in Ireland. This second kind of economics was closer to social history in seeking to understand the variety of economic behaviours and the development of societies over time. It was more akin to the empirical social science which was common among British philanthropists; though some of them were imbued with British political economy, they also sought and exchanged examples of social mechanisms which seemed to work. Overall, one might characterise the economic field as on the one hand a mixture of natural history and recipes, and on the other hand analyses of idealised situations, or what is sometimes called 'just suppose' economics. Between these wings could be found the historicist accounts which were long-term and loosely theorised.

That kind of mixture, in the decades around 1900, was characteristic of early business education, which also included much economic history. Especially after the Great war, it sometimes contained occupational physiology which had thrived in the war as a way of controlling 'fatigue'. And to that was added the Taylorism developed in the USA as a way of engineering the human aspect of production lines: the work of humans like that of machines could be broken into units which could be arranged for maximum efficiency. As for most such mechanical analysis the Taylorists' rhetoric was striking, their practice largely unsuccessful.

Management science has a long history of 'scientific borrowing' of this kind -- from Taylorism to flexible workers. Such 'theories' function like early medical theory; they provide a new language for old commonplaces, and they suggest practices which are rarely properly assessed either by careful data collection or by controlled experiments. They depend on an attenuated notion of science, focussed on analytical principles and neglectful both of observational data and careful experimentation and feed back

The problem for our present is that whilst medicine has become so much better both in assessment and at securing consent, politicians, policy makers and consultants, at least in British public services, have got worse in both respects. In matters of medical policy, the detailed knowledge of experienced clinicians and administrators is regularly discarded or overruled. The old mechanisms, such as Royal Commissions, which ensured that evidence was collected and issues debated, have been abandoned -- replaced with policy wonks with little experience, and by management consultants who claim expertise in process rather than content. The massive growth of business schools and especially of consultancies over the last 30 years has greatly magnified the scope and impact of this kind of these generalised decision procedures.

But it is not just by excluding experience, close analysis and experiment that this new paradigm fails any true test of scientificity. The claim to processual expertise comes with a commitment to market economics so deep that the bias often goes unrecognised. A recent history of the Research Dept of the English Ministry of Health simply equated policy research with economics[52]. There is no reason why political scientists, sociologists and indeed historians should not be systematically included as policy advisors, and so they are in some fields, but in recent British government, as the Treasury reached out to control most of the domestic agenda, it brought economic perspectives to bear across much of the public sector, with the all the consequent reductivism and exclusions. Look closer, and you will see that for many of the policy issues, the technical aspects of economics are scarcely required; what mattered, paradoxically, were all the considerations which were ruled out as not being economic.

That methodological exclusion de-legitimates the approaches of other analysts and of many knowing participants. For example, any sensible analysis of universities would begin with the independence and self-motivation of most of the academics – that in some sense they work for themselves and their place in their discipline, rather than for the institution that pays them. That should be a tremendous resource, a form of self-direction which is informed, flexible and requiring little supervision. It shows in the ways in which a physics department can maintain world-status over decades with relatively little administrative structure and little in the way of contracts, disciplinary measure, or financial incentives, even when many grades of workers are involved besides the academics. One might model this system as one in which superiors are there to facilitate the work of their juniors, and if you want an example, consider Max Perutz running the world's most famous molecular-biology lab whilst also working daily at his lab bench.

But models of corporations rarely have this dimension, so if you ask your local management school how they understand the university in which they work, they MAY know a little stack of helpfully descriptive American literature on how to run a department, but for the most part they simply equate the university with a corporation. And indeed, roughly speaking, you can indeed assess the quality of outcome across universities as to how well they fit the corporate model -- but of course, the correlation is inverse: the worst universities are corporate whilst the best are collegial. Discussion of hospitals work in much the same way: the qualities of professionals, which ought to be a huge resource, enter the accounts of managers chiefly as obstructions to managerial control.

This then is the charge sheet – that much of recent public management and policy-making closely resembles 18c medicine in its dogmatism, ignorance of alternative perspectives, and its exclusion of the careful histories, critical data collection, and of careful controlled

[52] Clive Smee (2005), *Speaking Truth to Power*, Radcliffe Publishing, Oxford, The restriction was brought to he attention by Rudolf Klein.

experimentation. The claims to superior knowledge by outsiders with little experience and transient involvement, mostly serves to exclude other forms of science.

The results are disastrous – wasteful contracts, careless long-term commitments, the erosion of trust and the deprofessionalisation of activities where trust ought to be central. Health policy in Britain now is shoddy by anyone's standards, and reckless to a degree which shocks almost all of those who care about it. Casting about for mechanisms will deliver quickly, Downing Street is easy prey to wonks, consultants and the more direct agents of private companies which promise to deliver health tomorrow at the cost of payments today[53].

This increasingly centralised control-system survives because it operates behind closed doors and neither politicians nor professionals are able to criticise or promote better standards of governance. No one believes government statements and no-one knows how to get at the truth. A government that once recommended evidence-based policy making now practices policy-based evidence making. And public consultation mechanisms which once suggested democracy have degenerated into camouflage for central decisions.

In an age awash with information, and one in which medicine at last understands both clinical assessment and informed patient consent, we are forced to leave heath service policy to the direct equivalent of 18c charlatans, many of whom, in the best traditions of quackery, have a direct personal interest in the commercial mechanisms prescribed. Expertise is cast aside and critical assessment abandoned, and a scientific and patient-respectful service is demoralised, churned and privatised under the rule of ignorance.

Dorothy Porter

Politicized Positivism and Humanitarian Values: Some Brief Historical and Speculative Reflections

Subscribers to and practitioners of natural philosophies, secular ethics and scientific rationalisms have forever perceived themselves to be under siege from authoritarian mystical faiths, the hegemonic power of vested interests and the structure of social, political and economic hierarchies. Early in the twentieth century, however, critiques of the relationship between the politics of scientific epistemology and the politics of social transformation began to be voiced from within scientific communities themselves. For example, having witnessed what they believed was the mass destructive power of the physical sciences in the First World War – and the mechanistic philosophy of reductionism on which the physical sciences were based – some from within various European scientific communities undertook a re-evaluation of philosophical holism, interrogated reductionism and produced imaginative fables about the fate of scientistically determined futures, such as the science fiction novels of J.B.S. Haldane, J.D. Bernal and Bertrand Russell.

The critique of Enlightenment rationalism pursued by intellectuals from a wide range of humanistic disciplines from the Interwar years expanded this cultural expression of anxiety about the authoritarian potential of the effects of what Max Weber had first problematized as the impact of scientific rationality in producing professionalized, Taylorized, one-dimensional

53 For insights on privatisations see Alyson Pollock, *NHS.plc* ((2004), Verso; for NHS management consultancies, David Craig with Richard Brooks (2006), *Plundering the Public Sector*, Constable.

bureaucratic social orders. A debate subsequently ensued surrounding 'science as social relations' which was exemplified within the post WWII ideological struggles within Western Marxism. In this debate Bernal-inspired visions of 'scientific socialism' became characterized, from the 1960s, by Hegelian Marxists as an Orwellian nightmare of technological totalitarianism leading *Toward a Rational Society* inhabited by *One Dimensional Man*. The archeologist of knowledge Michel Foucault extended this critique beyond an internal debate within Marxism to an investigation of a universalizing legacy of the Enlightenment in the creation of disciplinary knowledges that facilitated ideological systems of panoptican surveillance through heuristics such as 'bio-power'.

In the last quarter of the twentieth century and the early years of the twenty first, the politics of science and society have moved beyond politicized intellectual discourses to the theatres of power in a globalized world characterized by a forceful contest for colonial cultural monopoly. In this historical moment, science as a logic of domination continued to be dissected within post-colonial analyses of the determinants of subaltern oppression and diasporic disenfranchisement. In a separate context, but at the same time, science has been represented as a demonic influence in a divinely ordered universe within the articulations of faith enthusiasms that are nevertheless at war with each other.

What, therefore, does the conflict ridden history between science, scientism and political change have to offer an understanding of the role of scientific and secular rationalism in the future of a globalised world in the twenty first century? Are the latest faith wars simple conflicts between alternative forms of authoritarianism and is the possibility of linking emancipatory knowledge to the democratization of social power a futile illusion?

In the 1920s the Belgian emigré to Harvard University who founded the history of science as an academic discipline, George Sarton, described his philosophical desire that scientific progress continued to be guided by humanistic ethical values as 'scientific humanism'. The idea of creating a synthesis between science and Enlightenment 'humanitarianism' as opposed to Renaissance Humanism remained a goal of scientistic utopianism throughout the twentieth century encapsulated in conceptualizations such as Julian Huxley's philosophy of scientific humanism as a secular ethic founded upon the dictates of the 'modern synthesis' of evolution. But in all expressions of scientific humanism in the twentieth century, the logic and content of humanistic discourses remained subordinated to the tenets of positivist philosophy. Perhaps the most explicit articulation of the latter was made by the social biologist, E.O. Wilson, in his conceptualization of concilience and the unity of knowledge. Hence, scientific humanism and holism has been historically linked to epistemological conservativism expressed by politically reactionary scientistic philosophers and practitioners.

However, although an expression of conservative patrician paternalism scientific humanism was not always linked to reactionary political agendas. Within medicine, for example, in the 1930s and 40s experimental discourses on clinical humanism as a form of social medicine were inherently bound to a political agenda of reform. Advocates of clinical humanism such as John Alfred Ryle identified a central goal of social medicine to be social structural transformation that would redistribute economic resources through the institution of universal systems of health care provision funded through taxation. Does a discourse on the interface between humanism/humanitarianism and science, therefore, still hold any possibility of contributing to the creation of a non determinist epistemology, a democratization of social ethics and egalitarian reformation of social structures, economic distributions and the operation of political power?

One area to explore such possibilities surrounds the question raised by contemporary biomedical science and practice about what it means to be human. The repressive influence of new-eugenical molecular and genetic biological determinism upon this question has been widely debated, most sophisticatedly of all by theorizers of disenfranchisement resulting from biological determinism in the field of disability studies. However, in a separate, almost parallel universe of discourse embryonic stem cell research is championed by patients and parents of patients hoping for new therapeutic or preventive interventions in otherwise incurable chronic conditions such as childhood diabetes. Furthermore, the political campaign that persuaded Californian taxpayers to vote to pay three billion dollars to expand such research was represented as an heroic social democratic opposition to the rapidly accelerating authoritarianism of extreme right-wing, Evangelically driven political governance of the American population. The patients and parents who drove the Californian Initiative were members of the somatically discriminated against and yet fought for a biologically determinist expression of Foucaultian biopower as a radical political social action. This complex dialectic did not go unnoticed by anti-eugenic activists who developed a 'Pro-Choice Say No to Stem Cell' political campaign and equally by the 'Pro-life Say No to Stem Cell Campaign' who both exploited it to the maximum. Somatically challenged democratic citizens and parents defeated both the pro-choice and pro-life 'No' campaigns on the basis of the authority of humanitarian interest. The humanitarian interests of patients continued to remain paramount in the post-election campaign and retained the controlling influence over research questions pursued and the distribution of funds.

There is insufficient space here to explore the implications of a relationship between humanitarian invested, self-consciously social democratic political values and the politics of positivist epistemology. But the Californian Stem Cell Initiative is possibly an illustration of a new heuristic exchange that can be seen to be replicated in some development health economics, global science and technology studies, scientific environmentalism and even at the heart of Foucault's nightmare, the politics of bio-power turned on its head. An example of the latter for instance is scientific conflict over obesity causality between structural environmentalists and neo-liberal individualist behaviorists. The political agendas of these opposing explanatory models diametrically oppose each other within what might best be described as a war over 'Big Food' that mirrors wars of attrition fought over 'Big Tobacco' and 'Big Pharma'.

What new possibilities remain for positivism politicized by humanitarian social democratic values they can not become realized, as Jurgen Habermas has pointed out, without the relationship between knowledge and vested human interests and values remaining discursively redeemable.

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Mordechai Feingold and Victor Navarro-Brotons (eds), *Universities and Science in the Early Modern Period* (Dordrecht, Springer, 2006)

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Jurgen Habermas, *Knowledge and Human Interests* (London, Heinmann Education, 1978)

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Toby E. Huff, *The Rise of Early Modern Science. Islam, China and the West* (Cambridge, Cambridge University Press, 2003)

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Dwijen Rangnekar

Questioning intellectual property rights

Law, in general, and intellectual property rights (IPRs), in particular, lie at that strange coordinate point between science, technology and commerce. This easily discredits views that suggest an independence or relatively autonomy of law from the wider/deeper strains of power that substantially structure social phenomenon. To be clear, epistemic communities involved in imagining, articulating and implementing the various principles of law are, often enough, implicated in the process. A variety of social, political and economic actors (individually and collectively) come to bear upon law, seeking to shape the architecture of law in their favour. And, change like the accretion of IPRs in new subject matter or the transformation of the composition of rights is testimony to the success of particular groups of actors. The significance of IPRs goes well beyond this. To begin, it is well recognised that IPRs enable appropriation by parcelling knowledge and creating a market. However, they also legitimise certain activities through the award of a right – adding the useful veneer of inventiveness and creativity. Thus, the cultural use of 'patents' as a short-hand, such as in adverts, to suggest cutting-edge technology. Further, there is a hierarchy in privileging particular activities and forms of knowing. This is often seen through practice and case law where lab-based activities are accorded a privileged status of 'inventive activity' and oral knowledge of indigenous communities disregarded.

There is a particular contemporary context to the questions about IPRs. First, are the forms of global governance that have emerged in recent decades. Contemporary globalisation is structured by a mix of supraterritorial, transgovernmental, regional, and private forms of governance. It is within the complex mix that the principles of, and architecture to, IPRs are largely set and detailed. No doubt, groups and individuals disenfranchised by these networks and forums do make every effort to engage with and infiltrate them. At times, these actors are successful in shifting forums and developing counter-hegemonic principles. Second, is the phenomenon of corporate consolidation and globalisation. It is difficult not to take note of the level of corporate consolidation, either in terms of market shares or IP-ownership, and bring this to bear on questions about IPRs – and by extension to access to technology and products.
Among the various historical trends that may be observed in the evolution of IPRs, two that occupy primacy in terms 'science and politics': (a) the continuing enclosure of new subject matter and (b) the continuing strengthening of the rights. If a third were identified, then it would relate to the expressions of concern within quarters of the Global South's about globalisation of this architecture. The accretion of IPRs – patents in particular – has occurred through a mix of case law, that sets new doctrines or reinterprets earlier ones, legislative change, that delineates new protectable subject matter, and institutional reform. Here, it is difficult not to note the remarkable linear trend of ever-encompassing and deepening commodification, which some scholar have likened to the enclosure movement. The second trend is a transformation in the scope of protection where a similar linearity is discernible, in that the rights have become increasingly strengthened. The processes through which this has occurred are equally similar. Thus, for example, both the scripting of exceptions to patents (e.g. experimental use) has been diluted and the courts have largely tended to narrowly interpret the same.

It is within this context (the corporatised and globalised world) and trend (the expansion and strengthening of IPRs) that the following areas of concern/question are identified:

- The implementation of an increasingly complex architecture of IPRs – negotiated at various forums of global governance – places a premium on institutions, particularly in the Global South. It is here that epistemic communities come to play an important role in enabling implementation. Often, raising questions of cognitive lock-in with specific forms of IPRs; thus, constraining the imagining of alternative IP regimes.

- The dual expansionary trend of IPRs strains forms of well-stabilised transactions in society (e.g. exchanging seeds or pieces of creative works). These act of sharing questionable, particular as we move between the physical and the digital medium. Along with deeming them 'illegal' new forms of porous legality emerge in the contested commons.

- The continuous parcelisation of knowledge and the embedded hierarchy of privileging particular forms of knowing/knowledge has generated a threat of misappropriation of knowledge. One phenomenon of this misappropriation has been christened *biopiracy* – the appropriation of indigenous biological knowledge through patents.

- The dislocated production of knowledge, particularly in complex, cumulative and science-intensive technologies has become ever more problematic. The increasing parcelisation of knowledge and its distribution through patents held by different firms has raised concerns about the complex access negotiations and transaction costs. Increasing protection can also cut the other way in creating stronger and more impregnable hurdles to cumulative technological development. Taking this concern to the Global South presents us with a deeper urgency that may be captured in the metaphor of a 'scientific apartheid' – particularly through recognition of the local, tacit, and cumulative nature of knowledge production.

Xavier Roqué*

The set of questions to be discussed in the call for the workshop are entirely appropriate. In connection with the first (*production*), I think we should explicitly address the issue of size and remember that the term Big Science was coined in the 1960s to question trends in the organization and practice of the sciences (particularly physics), as well as attending changes in science policy. Some scientists regarded the way science was growing as potentially damaging to the scientific enterprise itself. I wonder to what extent EU policy makers are aware of this foundational criticism, and in which sense, if any, could this objection be raised today. EU projects tend to be Big, and excellence tends to be directly though not uniquely related to size. I think this invites historical comment and analysis.

The public permeates the call, but I think it deserves explicit attention. A recent European Commission publication, for instance, acknowledges that "it is the public at large who confer on science its democratic legitimacy, and therefore keeping up a dialogue is imperative" (*Questions of Science. Echos of the Science in Society Forum, Brussels, 9–11 March 2005*, European Commission, 2005, p. 4). So far so good, yet the text goes on "it is the media and politicians who act as the interpreters in this dialogue". We know, and the report will make it abundantly clear, this assumption is historically untenable, as science in society implies a far greater variety of actors and relations. Given the ultimate aim of the meeting I think it is important to make this point, as policy making on science and society often ignores the various forms of interaction. Moreover, I do not think the media, for all their progress in that matter, represent science in all its complexity, and this effectively limits public dialogue about science ("we must guard against the too slick use of communications media to give an empty illusion of public participation", H. Nowotny, *ibid*., p. 5).

This point is related to the consideration of the public ("society") by politicians. Science studies show the public is not only able to make sense of complex scientific (economic, political…) issues, but also that it has often played a key role (think of AIDS activists, for instance). Is political action vis-à-vis science any different from action vis-à-vis economy or law? On the other hand, it is often assumed that a proper understanding of science will result in increasing respect and will awake scientific vocations, but perhaps a less angelical and more nuanced view of science could be potentially more enticing to the public at large.

A couple of local remarks, if I may. Our set of questions appears sophisticated when looked at from countries that do not yet give science much value in terms of resources and state support (and many European countries, including Spain, remain in this list despite efforts to the contrary in the last 20 years). In those countries it is the import of science that is at stake, and this easily leads scientists, politicians, and the media to propaganda; there, what we historians of science take to be almost common places about science in society are completely ignored when it comes to public and social debate (in spite of social and academic activism on specific issues, as with military R+D in Spain, see http://www.prouinvestigaciomilitar.org/). How do our recommendations translate in these cases?

Differences might also be significant when it comes to chronology. Take the Cold War. It certainly had an effect on science policy making the world over, yet its impact was obviously not felt the same way everywhere. Even inside Europe, political, cultural and social conditions at the local or national level (dictatorships in countries like Greece, Portugal or

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Spain, for instance) arguably had a greater impact on the question of science in society, than Cold War.

This is not necessarily disadvantageous: Kostas Gavroglu text in this collection makes clear peripheral questions might be central to peripheral countries. Moreover, when it comes to critical issues, such as gender and science, in many countries it appears that the relative paucity of scientific establishments and industrial connections throughout the 20th century has resulted in greater chances for women. A 1990 survey by Jim Megaw (York University in Ontario) showed that women represented 30% to 47% of faculty in countries like Hungary, Portugal or the Philippines, as opposed to 5% in Japan, Canada or West Germany, with France and Spain somewhat in the middle (15%) surely for different reasons (Marcia Barinaga, "Surprises across the cultural divide", *Science*, 263 (1994), 1468–1472).

I should finally like us to be reflexive about the meaning of the workshop on two counts. Policy makers often summon experts, but it is not always clear to me how do expert reports and recommendations translate in political action, in the broadest sense. What about the history of past attempts to exert political influence? Think too about policy makers and their role. Are policy makers exerting too big an influence? I do recognize we need them, and also that they need to carve a professional niche, legitimate their work and become visible; yet I should question their self-perceived importance.The issue is clearly related to the "reconfiguration of the political sphere… from below through new forms of political action" (call for workshop).

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Aslihan Sanal

Commodification of the body for biomedical research and practice.

What are the characteristics of the human condition created by the impact of sciences and technology today? How does it define itself, its boundaries, its political stand? How does science and technology effect transformations in social change and subjectivities that also define the norms for a good common social life? These are the questions I am interested in understanding the relationship between the scientific and the political.

Biomedical technologies and biosciences open a field of study on how we give meaning to ourselves. They are a part of our everyday life; and they are rooted in traditional distinctions between the sacred and the profane, the normal and the abnormal, the societal and the marginal, life and death. A cross-cultural study of the culture of biomedicine will give us a chance to see how the state imposes regulations that make its subjects instruments of its biopolitical agenda at national and international levels. At the individual level, it will show also how people make sense of these technologies, internalize them into their everyday routines, and invent rituals that unify processes of practice, production, and consumption.

The realm of bioscience and the biomedical practice are not separate from the realm of commerce where merchants or brokers who trade its products. The world of the scientific experiment extends and creates local experiments mingled with traditions and a feeling for the "new." The lab and the patient, the wealthy and the poor, and the trade routes from north to south are inter-connected. Seen from this point of view, inequalities and everyday violence is not separate from the world in which patients seek healthcare, nor are they separate from the mechanisms that shape certain research operating within the same economy.

In this context I am especially interested in understanding how scientific objects—biomedical products such as body parts, cadavers, allografts, organs, tissues—are being harvested from certain bodies and reinvented as biomedical objects to supply the demand. Tissue engineering, transplantation technology, and regenerative technologies are part of a growing market, which needs human body parts that drive its economy. There is a very large market for human body parts, which involve large-scale biomedical research and medical practices, trading agreements and regulations, mobilization of doctors and patients, national and international bioethical debates. The recent body of scholarship points at deep cultural, religious, and political differences that effect the commodification of the body. "Organ tourism," "occult economies," "bioavailability,' "business of life," "biological citizenship" are some of the anthropological terms used to define the moment of connection between a life altered and the feeling for oneself in the mids of biomedicalization, inequalities and human trafficking.

We cannot, however, speak of understanding this human condition without knowing the historical processes, which have led to it. It is deeply embedded in the colonial histories, the capitalist market economy and the religio-moral world it is born into. It is an extension of a long process of making the self, which makes the bios today. In Turkey, for example, one finds it in the ego-ideal, in the Westernization, "humanization," and civilization processes. Patients who have grafts and transplants, doctors who conduct these operations, and merchants who trade body parts all make a reference to the absence of the "human" in the spheres of life they operate in. They are involved in a normalization process that is established upon traditional categories of inclusion and exclusion. The biomedical technology uses bodies of suicides, the mentally ill, and the poor, and justifies this with an analogy to state violence. Organ trafficking is a natural extension of this biomedical condition. Differences in the traditional understanding of the body, life, and death effect how the corpses are kept, bodies are traded, tissue engineering laboratories expand, hospitals get privatized, organs are sold. While boundaries shift, politics of life define what a common good social life is about for those who can afford it.

The effort of normalization, the effort to humanize an absence, the effort to draw the boundaries of the social is where we can understand scientific and the political today. We will find clues to these processes in discourses of life and death. They are inherent in the ways doctors, merchants, scientists, and patients invent rituals to internalize bare life into the social to legitimize their actions. They are symptoms that lead us to understand where our cultural vulnerabilities are, whose bodies become its objects, and how experts regulate, invent, speak of politics of life.

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Carsten Timmermann

Ownership and Responsibility in Healthcare, Higher Education, and Biomedical Research

Issues of ownership and responsibility have long been central to both science and health policy. Who owns knowledge and the potentially profitable results, for example, of publicly sponsored biomedical research? Individual researchers, universities, or the state that funded the research? Christoph Gradmann’s recent account of the events around Robert Koch’s promotion of tuberculin as a revolutionary therapeutic substance in 1890 demonstrates that these problems have a long history. When Koch negotiated the conditions for the release of this product of his research with the Prussian government, a potential cure for TB, the most pressing public health problem of the time, this was uncharted territory. Why did the state offer him money? Whose responsibility were health problems? The patron-patient’s or the

him money? Whose responsibility were health problems? The patron-patient's or the government's? Such questions are fundamental to the history of public health. Tuberculin, in fact, gave rise to a drug scandal with many of the ingredients of later scandals, issues of regulation, control and responsibility. What are the consequences of shifts in ownership and responsibility for public health, innovation, and education? In science, education and health policy, ownership and responsibility are distributed in a complex matrix that reflects national and cultural differences and whose parameters shift over time. I believe that with studies of this shifting matrix we can contribute most profitably to current political debates.

Shifts in the ownership-responsibility matrix have been following long-term political trends. For a long time the dominant trend in Western Europe was one of expanding welfare states and state-sponsored expansion in higher education and research. The models were chosen accordingly. In the late nineteenth and the early twentieth century, in science the state-run German higher education system with universities and technical colleges where the unity of teaching and research was emphasised and state laboratories as repositories for industry standards, and in healthcare the German social insurance system, provided dominant models. The isolation of the Germans in the first half of the twentieth century along with the apparent success of American capitalism on the one hand and a fascination with the Russian revolution on the other changed the parameters. In post-war Germany, East and West, both medical research and the organisation of the health system in part reflected the competition between the systems. Like in the British National Health Service, however, local and national traditions were equally crucial. More recently, with a consumerist turn in both healthcare and higher education in most of Europe, the American model has become the dominant one. This trend is visible both in Britain and in unified Germany. Institutions in higher education and research (universities and research institutes) as well as in healthcare (hospitals and insurance funds) are told to think about their clients as customers. They are turning into 'service providers'.

These developments, representing the reversal of a long-term trend towards ever greater government involvement in European research, education and healthcare, have not been without consequences. The British welfare state patient, entitled to healthcare from cradle to grave, is replaced by a somewhat paradoxical sort of consumer patient: told by the state that she is responsible for securing her own wellbeing, but pressed to attend screenings, for example, by a medical profession keen to meet government targets. Medical innovation, too, is a matter for private enterprise (encouraged by keen governments) rather than state-funded research. Similarly, in higher education, students turn into consumers. Universities, to a greater or lesser degree in different countries, look increasingly more like private companies than departments of state administration. Because of different traditions, this transition seems to be easier in Britain, for example, than in Germany. But the students are not the only customers. Universities are encouraged to seek commissions from companies or launch companies themselves where knowledge promises financial returns. Even the interactions between universities and state funding bodies are re-designed so that they look more like contracts between companies. Knowledge is increasingly reduced to intellectual property, and health becomes (again?) a form of personal capital, in which those who can invest. Students, patients and researchers, all are told by a strong central state to behave like companies. However, since most of these constructs are hybrids, neither completely private, nor any longer really state-run, and since nevertheless much of the funding is still public, new (often untested and unstable) models of accountability and control are tested and introduced. Historians of science have long been interested in the nature of evidence, and we can use the results of our historical work to understand recent approaches in evidence-based medicine and governance more broadly. Our challenge as historians is to explore the shifting matrix of ownership and responsibility, and by way of detailed case studies, explain how developments may be linked.

Good historical case studies help us understand how models are implemented in specific situations while not forgetting about the wider context. Historians and historical sociologists

can provide detailed information on the origins of changing models of ownership and responsibility and their consequences for medical innovation, public health, and higher education; and a well-chosen case study can explain how these fields are connected. Good studies on the consequences of changes in the ownership-responsibility matrix in different post-WWII national contexts are, for example, Gaudillière on the invention of biomedicine in France or Goodman & Walsh on Taxol. In Manchester we are currently working on studies that explore post-war developments in research on and the treatment of cancer and other diseases, both somatic and psychological. However, I believe that as important as producing these studies is to write them in a way that make them relevant and accessible to relevant audiences (our customers?), and I would welcome a discussion on who these audiences may be and how they might be reached.

Helmuth Trischler

History is not only "key in challenging our imaginaries of the past". Historical knowledge, based on critical, thoughtful and rigorous historical analysis, also provides an important source for political orientation and a better understanding of our present-day society as a knowledge society which is shaped on all levels by scientific and technical knowledge. What could have demonstrated more clearly and visible the inherent connection between history and the presence than the "International Einstein Year 2005" when a truly media hype emerged around the historical figure Albert Einstein. In this hype, Einstein showed up as an icon of modernity, and he was used by numerous actors from politics and science alike to convey the overall message that scientific knowledge is crucial for our w and will determine our future.

Looking back on this hype, it is by far not clear that historians (of science) have been able to control their definition power on the historical figure of Albert Einstein in particular and on history of science since Einstein in general. All the more it becomes important to understand the interconnectedness of historical knowledge and its role and use as a source for political and public orientation, not to speak of legitimization. **To discuss this interconnectedness should be of particular importance for the Workshop in Brussels.**

It has been proposed to put a specific emphasis on the three dimensions of production, restriction, and regulation of science and scientific knowledge. Embarking on this agenda and screening my own research interests, I propose two topics as discussion points for the workshop and case studies for further research within the domain of science and politics:

(1) Contract research – Market regulated regimes of knowledge production

At the end of the Cold War, American research universities complained about the loss of the old "social contract" between science and society which had been established in the Second World War. On the basis of this social contract, science promised to produce relevant knowledge for the sake of society and the state/politics provided the necessary resources to enable the scientific community to perform research. When the Cold War came to an end, (American) universities felt to be thrown into the cold water of acquiring the necessary resources for research at the market. The loss of cosy and comfortable long term contracts with governmental agencies had to be filled by short term contracts with corporate agencies. In Europe after 1945, interestingly enough, market-based contract research was perceived as an American invention, as an integral part of the American way of capitalizing knowledge.

The historical process of the emergence of market-oriented and contract-based research has neither been thoroughly studied nor adequately understood. To overcome this crucial gap in

historical knowledge is all the more highly pressing as in the ongoing discussion on an emerging "new regime of knowledge production" the market is perceived of being the decisive regulatory force of producing and disseminating scientific knowledge.

(2) Defence Science – The NATO as a transnational innovation system

Not just for political and strategic reasons, after the Second World War the United States became the dominant force for military innovations. In addition, the US developed into a cradle for a series of new technologies, forcing the different European states to access this defence-related knowledge and simultaneously develop their own knowledge bases. This process engaged a variety of different actors, depending on one another, shaping the process of military innovations, and navigating in a very complex political and economic landscape.

An integral part of this landscape was – and still is – NATO. This most important organisation in the defence sector on the Western hemisphere – most likely also its counterpart on the Eastern hemisphere, the Warsaw Pact – should not only be understood as a political actor category. It can also be understood as a transnational innovation system, an institutional setting of producing and disseminating knowledge of military relevance.

A novel look on NATO as a transnational innovation system can provide us with fresh perspectives on the production, restriction, and regulation of knowledge under the auspices of security and secrecy. Such a look would also foster our understanding of tensions between Europe and the US, both during the Cold War and after the Cold War up until today.

Claire Waterton

1. My first point for discussion would be a request to see if we can talk about science in terms that are broader than the concept of 'knowledge'. When we talk of science as knowledge (although this is tempting because 'simple') we tend to delete a lot of vocabularies that we (I include here in the 'we' at least sociologists, anthropologists and historians of science) really want to include. Can we talk about science as:

- a putting together of materials
- a specific form of labour
- a set of activities/practices that have their own temporal and spatial needs and dynamics
- an imagination of present and future economies
- a form of politics
- a brokering between social groups (a making, re-making of social collectives)?

2. Once we think about science as a set of practices, materials, imaginations, social arrangements and so on (as above), science both becomes more interesting and more connected to human rhythms, culture, politics, concerns, possibilities.

And so, my second point would be to suggest that we try to keep this human-ness at the forefront if we are thinking about science and society. [As an aside, the term 'science and society' itself seems problematic (and paradoxical) from this perspective because it harks back to a separation between the two nouns that the phrase, taken as a whole, is trying to avoid. Thinking of 'society in science' seems better: it steers us nearer to a sense of science as an intrinsically social, cultural set of activities and gets us away from the objectification of

cally social, cultural set of activities and gets us away from the objectification of science as a-cultural, a-social.]

3. The workshop organisers have raised the question of the 'production of knowledge' and the 'restriction of knowledge'. History of science (e.g. Schaffer and Shapin 1995) has made visible for us not only the questions of where and who produces knowledge (the lab and the scientist) but also questions about the wider witnessing, the necessary co-production of the social/institutional/political *and* knowledge-making.

As lay people we know today that lots of science and technology is getting done, but perhaps not always how this is supported, witnessed, demanded from a wider social, political context. So, there are many unknowns there for the lay person (and sometimes for the scientist, engineer, technocrat). Understanding the dynamics of how and why science is supported and witnessed today (or to use the jargon 'co-produced' with a wider social, political and cultural order) is a real challenge because there are many levels on which these co-productions are simultaneously taking place. But if we are thinking about 'society in science' it seems important to make the connections as visible as possible. The kinds of questions that may be useful to increase visibility ask are:

- For what reasons, through what circumstances, do certain scientific activities come into being? [Note especially the 'extra-scientific' rationales for their coming into being that are often invisible]
- All science and technology takes effort, work, materials, co-ordination. What are the 'goods', the values, (including avoidance of threat, harm), associated with a particular kind of scientific practice?
- Whose 'goods' are they? [This should include bodies like 'The UK Treasury', national governments, the European Commission, WHO, etc.]
- Can we identify trends – e.g. the sense that science is becoming more privatised, hence more concretely connected to economic promises and value-expectations.

We can see if we map out these things that 'society' is always producing science (not scientists!). This opens up a legitimacy for questions about politics and governance. Research has found that lay people understand science to be thoroughly social/political and ask these kinds of questions anyway ('who has made decisions about what should be researched on our behalf? Can we have a say?'). If institutions with power concerning scientific and technological activity really want to think about society-science relationships (rather than to do so superficially) they need to learn to respect, anticipate and draw out such critical questions from others. They need to learn, in a way, how to make science and technology more deeply, more fundamentally come from within society, culture and politics. This is often counter-intuitive to many institutional understandings of what science is, and may be threatening to certain bodies, perhaps like the European Commission, who sometimes use science as a neutral political bond, as a way of avoiding politics, rather than engaging with politics.

4. 'Philology' is the humanistic task of understanding texts as far as possible from within an understanding of the culture and society in which they were written. History has a similar task in avoiding 'whig' histories. I would like in my last point to thank the organisers of this workshop. What it seems you are trying to do is to create a space for a humanistic understanding of science and technology in contemporary times.

You have asked for a normative expression of what might be considered an ideal public sphere for knowledge production, appropriation and regulation. I think that you will partly produce an ideal public sphere in the meeting to come at the end of June in that you will have

bureaucrats, political actors, those with influence over technoscience, with historians, philosophers, social scientists (and others?). All these people thinking about society and technoscientific production together. I think you have grasped the mettle in creating this forum for debate. But more could be done: creating this kind of forum is something that needs to happen at many different scales, it needs to be made legitimate, it needs to be expected as a normal part of creating and recreating society (which I think is what science and technology partly does). I suppose I should add that I do not think that it ends with the fora: the challenge of understanding and reflecting upon what society is doing, how it is reproducing itself and how it is shifting and changing, at the time that it is doing it, requires a very subtle and critical understanding of culture and activities. I think what is required is a kind of nurturing and support of that critical understanding – this will be needed again at many different levels of society, in many different kinds of institution (political, educational, business, etc.).

Short bibliography of case studies and theoretical work submitted by Claire Waterton, Department of Sociology, Lancaster University.

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Peter Weingart

Evaluation of knowledge production in higher education and research institutions and its unintended consequences

A plethora of practices pertaining to ‘new public management’ have been institutionalized in recent years, among them evaluation schemes that are supposed to regulate, in particular differentiate higher education and research systems. They make use of a rhetoric that owes its concepts and rationale mostly to the world of business administration, management schools and consultancies and focus on concepts such as *accountability*, *transparency*, and *efficiency*. Regardless of whether the object of management is an individual or an institution, the main techniques are continuous (self-)observation and (self-)intervention: As inner or outer conditions change, a new (self-)intervention is called for. Today, management systems abound that offer help for systemic inspection and the search for adaptive responses. From

offer help for systemic inspection and the search for adaptive responses. From New Public Management in administrative domains via evaluation systems in science to individual self-management aids, managerial procedures currently pervade contemporary societies (Power 1997). These concepts of accounting and its corollaries are not just rhetoric, they are also based upon techniques that ultimately produce the accountable entities they are targeted at.
On the operational level the new régime is supposed to enable universities and research institutions, at least ideally, to act like corporations, to be responsive and accountable to the public, and to manage themselves. The expectation is that they will act more efficiently with respect to their (self-) assigned tasks than if they continued to be directed by state bureaucracies. Far-reaching visions see the universities (or rather: a few of them) acting on a knowledge market where a major part of the university's income is realized from patents and cooperative ventures with industry, even though this is only realized by very few of th US universities (Slaughter 1993, Mowery et al. 2004). The spread of global models of modern actorhood will certainly generate a great variety of realizations, including ritual adaptation and symbolic politics at the level of the individual institution. There is no doubt that most universities and other research institutions not just in Europe but also in Asia and Australia have already accepted the idea of organizational actorhood and its concomitant practices and techniques of extended corporate accountability and responsibility.

The main instrument with which governments have set out to place universities under this new régime are schemes of evaluation: rankings based on indicators that are supposed to make the complexity of knowledge production, transfer and dissemination measurable. Different countries in Europe and Australia in particular have institutionalized evaluation systems, most prominently the REA in the UK. One problem is that the multitude of indicators each of which measures, in highly simplified form, only a particular fraction of the activities that take place within the organizational framework of a university, cannot provide a coherent picture of such a complex institution, let alone rank any number of them along a meaningful scale. Rankings are partly meaningless if they compare units that are incomparable. Their multidimensionality makes them also useless for universities as organizations to adapt their behavior in a systematic way. But rankings have consequences. They are hyped in the media because of their news value, they suggest to policy makers that they reflect a true picture on which decisions can be based, and they serve to create steep hierarchies where there used to be a broad base of institutions.

This points to the serious problem of the unintended consequences that the implementation of indicators and rankings have on the production of knowledge and the behavior of scientists and their institutions. Indicators, when applied in conjunction with budgetary decisions and other types of sanctions, inadvertently become so-called reactive measures. That means when they affect people, these react to the implementation of such measures by altering their behavior. Behavior change is intended. For example, the link of citation measures to the allocation of funds is supposed to induce researchers to engage in more competitive publication routines in order to increase their publication activity and publish their papers in high impact factor journals. In many cases funding formulas are linked to more than just one indicator combining, for example, bibliometric measures with received external grants as indicators. The latter is intended to induce researchers to apply for research grants. Each of these indicators assumes a one-dimensional mode of reaction or an 'incentive compatibility', but that assumption is illusionary. Researchers can and are known to increase their publication count by dividing their articles to a 'least publishable unit', they can propose relatively conservative but safe research projects, and they can lower their standards for their PhD candidates. These are just examples how individuals can manipulate indicators or evade their intended steering effects. What is true for individuals is also true for institutions, they can do the same. Obviously, the effectiveness of research policy employing evaluative indicators depends entirely on the sound theoretical base of the indicators and on the requisite

on the sound theoretical base of the indicators and on the requisite knowledge about the reactions they trigger among the individuals and organizations whose behavior they are supposed to change.

So far only very few studies have been undertaken to identify the effectiveness and unintended reactions of this kind to bibliometric measures as well as secondary consequences for the university or the communication process in science as a whole. Sociology of science and ethnographic studies show that scientists do, indeed, react to non-epistemic influences (Gläser et al., 2002, 16). An Australian study showed that upon the implementation of formula based funding, i.e. in that case, linking the number of publications in peer reviewed journals to funding, the number of publications, indeed, went up, but the quality of the papers had not increased as measured by citations. The obviously one-dimensional incentive set by policy led to foreseeable counter-productive reactions.

On an anecdotal level the editorial policy of journals is accused of being influenced by impact factor considerations. The increase of medically related papers in top biology journals is attributed to "their beneficial effects on the impact factor, rather than for their scientific quality" as is the publication of review articles in specialized journals, since they are "cited more often than research papers" (Lawrence 2003b, 836). Thus, it is not surprising that publishers of scientific journals are eager to use favorable impact factors for the promotion of their products. This has led a well known journal in critical care medicine ("SHOCK") to an attempted manipulation of the communication process that borders on the absurd. Upon the provisional acceptance of an article the associate editor added that the journal "presently requests that several references to SHOCK are incorporated in the reference list."

The 'externalization' of the internal scientific control processes and the unreflected use of indicator schemes already affects knowledge production even though we do not know exactly how. It is obvious that the processes of evaluation and the application of indicators has become ritualized, i.e. removed from their original motivations. (E.g. costs of evaluations are not calculated against the savings they achieve). Thus, a major element of today's science policy is executed without policy makers and scientists being able to predict their outcomes and longer range effects. I suggest that this issue become an object of study. It requires the collaboration of sociologists and historians of science.

Annex 5

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