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RESEARCH ARTICLE

Rethinking Science Culture and Governance Today

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ABSTRACT

The paper discusses the four goals of scientific culture or public understanding of science (PUS) and these are: transmitting the values and skills on which our modernity has been built; preserving the nation's competitive edge; grasping the developments in contemporary science as a part of culture; and enabling everyone to play a full part in current debates. These goals form firm basis and provide platform for discourse of all the actors of public understanding of science. One has to understand various factors associated with these goals and these are discussed as necessity of promoting PUS to preserve the ability to innovate, controlling mechanism, PUS management and PUS governance, etc. The article argues that PUS today is forcing us to think of different processes and objects in constant interaction with each other. Further, the communicators and researchers need to remain mindful of public aspirations and in particular of the sturdy demand for a strong link between attitudes to science and democratic functioning.

KEYWORDS: Scientific Culture, PUS, Science Communication, Research Management

Introduction

The discourse to promote and raise the status of scientific culture (hereafter PUS) over the last 50 years is structured around 4 goals:

1. Transmitting the values and skills on which our modernity has been built;
2. Preserving the nation's competitive edge[1];
3. Grasping the developments in contemporary science as a part of culture; and

4. Enabling everyone to play a full part in current debates[2].

These goals are periodically updated and reasserted in accordance with the development of social, political and economic issues. Together, they form the core of the discourse bonding together actors and advocates of PUS.

We can only agree with these arguments. What could we object? Who would dare to deny the need for a scientific culture when the impact of science and technology — or to be more precise, the impact of techno-science — on contemporary society is such that we cannot conceive its evolution in their absence? How can we fail to notice their impact on professional activities and on every object, however humble, that fills our daily life? Who would deny that economic growth[3] is closely linked with their development? Who then would object to the acquisition and mastering of scientific and technological skills needed by this integration? There are so many arguments in favour of these goals that it is impossible to challenge their legitimacy. Thus, they seem unsusceptible to credible opposition.

The Question of Necessity

Under the pretence of promoting the need for PUS, some questions are eliminated out of hand. The main one is the following: Why has the individual and collective acquisition of scientific knowledge been perceived for over fifty years as a social necessity? One of the reasons is that populations adjusting to a constantly renewed sociotechnical environment implies that

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[1] This article was written by Western authors in a Western context. Therefore, the same questions might be differently tackled in different contexts or might not even be deemed central, if deemed pertinent at all. Thus, we would suggest to the reader to bear in mind the perspective adopted by the authors in order to fully grasp their thesis and relate it to their own context.

[2] It could be objected that no one can be an expert in everything, and thus it would be more accurate to talk of 'informed debate or informed choices' in order to underline the fact that individual contributions are coincidental. Yet, this is not the point! It must be stressed that this argument is a staple of PUS legitimacy discourse, and is an objective shared by most PUS practitioners. Thus, discussing it further does not contribute to the argument.

[3] If GDP is one indicator among others, such as the HDI, it is the most used. Thus, discussing its use further does not contribute to the argument.

they must constantly acquire new skills; and that updating these skills is now the essential requirement for preserving the collective ability to innovate, which is seen as the driving force behind economic and social development. Therefore, it is necessary to regularly update the level of skills and reassert the consensus in order to maintain collective performance.

This is nothing more than the transfer of a constantly evolving knowledge and its applications to the techno-economic sphere. Here, we encounter the spirit of the process described by Schumpeter which constantly revolutionizes the economic structure from within, destroying the old and creating new ones. This process of Creative Destruction is the main dynamic of capitalism (Schumpeter, [1943] 1994). This perpetual revolution in knowledge entails that of its applications and compels support for the process all the more as it is appears as a natural and irresistible phenomenon.

The strategy consists on the one hand in pretending there is a dissociation between the production of scientific knowledge and modes of development — as if science remained an autonomous sphere[4] — on the other hand, in treating the direct link between science and economic development as given.

This is why the issue is less that of the persistence of a line of arguments than the circumstances that motivate its present-day revival. Why, for example, should Universcience, along with others, feel it has to reassert the need for a thirst for 'discovery' and 'innovation' on the same level as the need for an understanding of the 'rapid and complex developments[5]' of techno-science? The issue raised by this revival is all the more pressing since the report published in 2012 by the French Inspection générale de l'administration de l'éducation nationale

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[4] It must be understood that research always takes place in a social context that encourages some research direction and mode above others. The existence of the Higgs Boson could only be proved because society thought it necessary to invest such large sums in particle physics research. The rising number of students in biology compared to the declining numbers in physics might herald a rebalance of the sums allocated to these fields of research.

[5] Universcience (non daté - undated), La culture scientifique et industrielle, un capital éducatif et culturel pour une société de l'innovation, et de la connaissance, www.universcience.fr/cs/(consulté le 30 novembre 2013).

et de la recherche raises the question of the pertinence of the continuing usage of the concept of scientific illiteracy when more than 50% of the university age population pursue higher education and more than 32% of the French labour force work in science and technology (Cervel *et al*., 2012). What about the worn out disaffection for scientific studies? 'Can we speak of disaffection when the number of newly-qualified engineers per year has almost doubled in the last 20 years (from 16 000 to almost 30 000 between 1990 and 2010)?'[6]

In other words, scientific illiteracy is not what is the real issue here. It is the distrust towards science and technology that must be countered. Given the pace of the development of techno-science, Universcience wants to prevent 'misunderstanding, mental block, or plain rejection'.[7]

Yet this anticipated and very much feared distrust has nothing to do any more with the fear of and resistance to science that, have been traditionally associated with a state of ignorance. In recent years, a growing ambivalence towards science has been identified amongst the more educated and cultured segments of the European demos (Bauer, 2009).

It seems to us that this ambivalence is born out of strong dissent about the historical and seemingly natural link between social progress, progress in knowledge, and technological and economic progress. This triple link is challenged because it is no longer justifiable to consider social progress as an inevitable outcome of technological and economic progress[8]. At this point, we can speak of a reasoned anxiety in people's minds at 'a time when techno-science and its impact on the community, and thus on the public sphere, is increasingly brought into question' (Cervel *et al*., 2012).

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[6] Holland: 38 %, Germany: 36 %, USA: 32 %, UK: 26 % ; EU average: 31 %, idem, p. 6.

[7] Universcience, op. cit.

[8] Of course, we can wonder who is the real culprit between science and capitalism. However, if the question is asked in those words, it has no answer since science and capitalism are intertwined to such a degree. Disasters, such as Fukushima (2011), feed public doubt, amplifying what the British Lords already anticipated: science is not aloft anymore.

Controlling Discourse

Faced with these doubts, several strategies are mobilized to control both the speech of scientists and of the public. In general, this control works through the de-legitimization of opinions voiced on both sides. It is easy to discredit the stands taken by the public by repeatedly measuring levels of scientific knowledge with tests that constantly reveal and construct a useful ignorance. But the repetition of these tests perpetuates the equivalence between the assessment of knowledge and the memorization of encyclopaedic and decontextualized statements (Raza and Singh, 2004) which in no way account for real knowledge, cognitive processes, or of the ability to deal with complexity that social actors muster on a daily basis. These standardized tests, for example, assess the public's ability to differentiate between the effects of antibiotics on bacteria and on viruses, for the sole purpose of pointing out that a great majority will get them mixed up, ignoring the skills needed to deal with highly complex conceptual and technological environments. These repeated surveys discreetly but faithfully serve the ideological construction of an ignorant public.

Paradoxically, this control also works through the de-legitimization of the position voiced by scientists. The exercise of critical reason, an essential component of the scientific mind since the 18th Century, is no longer of much use. It is even counter-productive within a neoliberal rationale. The Enlightenment no longer contributes to the wealth of nations. Thus, it has become necessary to dissociate the production of knowledge from the questioning of its origin and impact. The aim is to promote the role of the scientist, as producer of new and useful knowledge, against that of the scientist, as critical thinker.

Demoting Speech

This double de-legitimization takes form through the establishment of different systems of demotion for scientists and for the public.

Demoting the public's speech is achieved through hijacking, underrating and masking.

Hijacking brings discredit on the public's desires and expectations of well-being and social progress, considered to be secondary to the imperative of solving the global economic crisis. Putting the accent on individualistic reflexes, which is backed by an opportunistic research rhetoric centered on the individual as being solely responsible for his or her own life, reduces the desire for well-being to a state of self-serving concern. Caught in this trap, the social actors who demand well-being involuntarily become the accomplices and agents of their own demotion.

Underrating consists of calling into question the possibility of developing the means for public awareness and voicing of opinions, or of confining the voicing of opinion to a strict framework in predefined consultation systems, under the pretext that the public would in no way be competent enough to assess the complexity of contemporary issues and have an enlightened opinion on these questions. Purely institutional participative systems thus tend to allow individuals to express themselves on very general questions, above-ground themes, without allowing for of expression on questions claimed as pertinent by highly committed local actors. For example, a Consensus Conference on climate change will be suggested, while a demand for a debate on the construction of a new airport will be severely repressed on the grounds that the actors, though committed, are not aware of priority stakes for which they do not have the necessary expertise (Boltanski and Chiapello, 1999).

Masking is carried out by controlling, deleting, or jamming information in order to systematically maintain uncertainties and doubts on the nature and extent of collective stakes, supposed to be scattered across multiple interests and divergent opinions. For example, in the case of climate change, while the scientific community is in agreement about global warming and its anthropic causes, the media, who are supposed to represent the state of awareness and opinions in the public space, constantly maintain doubts and uncertainties which benefit those who have no interest in these stakes appearing as a collective responsibility[9]. Thus, the media contribute either to the concealment of certain real debates or to the artificial fabrication of public controversies (Oreskes and Conway, 2011).

Basically, these procedures aim to reinterpret the meaning of what is doing the rounds, and impose a view derived from the commenting, reformulating or editorializing of numerous statements, whether spontaneous or requested. For example, many evaluation procedures turn the reactions elicited from different audiences into judgements.

What seems important to us is that these processes free up the power of technocratic discourse. Technocratic discourse is set up as an inescapable mediation insofar as it is presented as a coherent, rational, anonymous and collective discourse in a confused and vague social space. It exploits the authority of knowledgeable discourse and short-circuits democratic debate.

Demoting scientific discourse is established by other means

The first is the order issued to the scientific community to limit itself to a role of expertise, a role which also happens to be very much in demand and has high visibility. In taking on the role of experts, which gratifies them with a social justification and demonstrates the value of science, researchers get caught up in the play of economic and political interests and become accomplices in their own loss of freedom of speech. We can observe more and more cases of dual roles: researchers offer their services as experts in response to private demand, while setting themselves up as arbiters of the public good by virtue of their role as so-called repositories of scientific knowledge.

The second system is direct censorship, that is to say, the ban on communicating information likely to inform public debates, and thus on taking part in them. For example, the Harper Government in Canada has forbidden federal scientists to speak directly to the public or to answer questions journalists could ask them on themes which are heavily dependent on science (water pollution, the environmental impact of certain technologies,

[9] We cannot remain silent about the now well-established fact that the media have their own interests, independently of democratic or scientific stakes; nor can we disregard the fact, also well-established, that they are at times subject to attempts at manipulation.

etc.). Any request for information they receive is to be passed on to the public relations department of the relevant ministry[10].

The third system has to do with the management of research. On the one hand, we can note the generalization of management techniques in research: the generalization of financing through calls for tender, benchmarking, the obsession with labels of excellence, the integration of techniques for anticipating outcomes and disseminating them, multiple evaluations at every stage of research and in every production unit (individuals, teams, networks, universities, laboratories, etc.). On the other hand, research is required to be anchored in economic processes, whether it be at the stage of obtaining funding for projects, which is granted in preference to consortiums of researchers and economic agents, rather than for the significance of the knowledge produced. Following this rationale, the knowledge value of what is produced is over-determined by potential economic worth. There is almost a direct correspondence between the value of knowledge production and the production of innovations having market value. Scientific invention today tends only to achieve full potential in innovation, which excludes numerous systems of knowledge.

These processes contribute to a growing heteronomy in the field of science. Contrary to the movement towards autonomy which characterized the development of science up till the 1980s, and whose institutional form was defined in 1945 by Vannevar Bush (Bush, 1945), a brutal reversal of trend can be observed from the 1980s on. All of the processes which had ensured the autonomy of the field have been called into question in the context of massive reforms of the organization of higher education and research in Europe, the USA and Canada. For example: peer review is no longer enough, it has to be coupled with multiple administrative assessments; the research timescale is considered ineffective compared with that needed by innovation[11]; the rendering of accounts to various authorities is

[10] The policy adopted by the Harper Government has attracted very strong reactions. Even a superficial search of the media on the Internet will give an idea of its extent.

[11] Thus, in France the time allotted for PhDs has been reduced to three years.

now an integral part of research; etc. Moreover, it is now inconceivable that research organizations and universities can live without the contribution of a high number of engineers and agencies for management, promotion, evaluation, and communication which now frame the activities of teaching and research. What researchers say about the conditions of the production of knowledge is no longer taken into account in the organization of research activities. The rhythms and timeframes imposed on researchers dispossess them in part of the specificity of scientific activity. Thus, this ebbs away and takes refuge on the fringes of the organizations: it is to be found in seminars or classrooms, all of them places for the sociability and temporality suited to scientific creation, sometimes on personal time and in relative clandestinity.

PUS Management

It is worth remembering that the 1980s were also characterized by both the assertion of the need for scientific culture, and by the support provided by the State, which included it in its priorities, and gave every encouragement to actors in scientific circles to take initiatives and engage in activities promoting science as a culture and the circulation of knowledge from the scientific community towards the general public. Thus, from 1982 onwards, following the Chevènement Conference in France[12], disseminating the results of research to the public became one of the missions of researchers and teacher-researchers, who are civil servants. In the same way, many centres for scientific and technical culture and associations involved in PUS received support. In any case, the state did not think it necessary to provide a framework for these activities, actors being free to decide on objectives and the means to achieve them. Established knowledge (advances in science) was to be made accessible to the largest public possible on the basis of an implicit, consensual and pragmatic model.

For thirty years, promoting and raising the status of scientific culture have remained a concern, but only one amongst many

[12] Colloque national sur la recherche et la technologie, organised by the Minister, Jean-Pierre Chevènement, in 1982.

others. The State, without backing out of its commitment, has not considered PUS important enough to continue playing a role, satisfying itself with lending support. Having ardently advocated the convergence of science and society, the State soft-pedalled on the mission, at a moment when the interdependence of science, technology and society was growing.

This discretion on the part of the State is paradoxical. In fact, the space of science and its impact in social discourse is greater than ever: many actors no longer subscribe to the dissemination model, which is still very much predominant, and consider science as a subject of debate. Furthermore, criticism of science, which had been intense in the seventies, has been reactivated by a series of major crises concerning health and the environment, which highlight the collusion between techno-science and certain economic actors who care little about the public good. Just for the record, we can quote the Chernobyl disaster in 1986, which inaugurated an unbroken string of widely publicised health and environmental scandals.

This intense questioning poses a challenge to the model of economic development through continuous growth supported by innovation. For example, the alter-globalization movement born against the 1999 Seattle WTO conference (Wintrebret, 2007) directly challenges the role assigned to science in this model, and thus takes part in what is now known under the generally accepted term of citizen science.

At the same time, Internet is becoming a part of daily life and brings great changes in the practices of social communication and forms of sociability. Thus, the advent of a digital and networking market creates a crisis in institutional and media communication which destabilizes the powers-that-be. Digital technology undermines traditional modes of communication and the hierarchies that underpin them; imposes the reorganization of scientific, educational and cultural practices; redraws the boundaries of social areas (as with universities); and pervades the systems and procedures for validating knowledge. As a result, a plethora of actors, from both public and private spheres, are using new communication technologies to take part in dissemination and discussion activities. These new practices are obviously transforming

contemporary forms of disseminating scientific culture, and weakening the traditional forms[13].

Moreover, taking advantage of the technologization of the social sciences, the growth of the managerial model gives rise to the development and application of tools for the management of activities and social productions (project management, evaluation, anticipation, quantification, communication, etc.). This managerial push can be seen as a counterpoint to the growth of the critical movement of citizen engagement, which promotes self-organization and advocates action on a local scale.

Finally, another major trend can be observed: the development of the steering of general policies at the supra-national level since the 1970s, with set slogans and agendas for states to adapt and adjust to. So there is a sort of reversal in meaning regarding the action of States, which is increasingly understood in terms of being centred on global issues and so inevitably less open to the aspirations and actions of their own population. A particular example as far as we are concerned is the role played by the OECD (Organization for Economic Co-operation and Development). The OECD, founded in 1961, incites its member states on the one hand to adopt a science policy, and on the other hand to invest in research in order to tackle the new scientific and technological challenges and improve their economic competitive edge. In the 1963 report *Science, Economic Growth, and Government Policy*, the OECD in particular recommends the development of national science policies, a recommendation to be followed by a majority of states involving the creation of ministries for research, responsible for setting up a national policy. In 1971, a second report, *Science, Growth, and Society*, after recording that most member States had implemented measures for the coordination of the national scientific effort, insists on the fact that science and technology form an integral part of economic and social development and that this implies a much closer link than in the past between science and technology policies and every field of

[13] Of course, the impact of communication technologies is proportional to their level of development. However, their impact is not as strong where they are not as pervasive or reserved for an elite.

socioeconomic concern and government responsibility (OECD, 1971: 107). In a word, the OECD takes due note of the growing integration of science and society, and of the structuring effect of this integration. The OECD concludes, then, that the development of present-day society cannot be conceived without that of science and technology, and as a corollary, that the idea of economic and social progress is so closely connected with that of the development of science and technology that the two tend to merge. The OECD came back again in 1981 with La politique scientifique et technologique pour les années 80, when the economic context had changed and a structural crisis followed the period of rapid growth which characterized the post-war period. In this new context, the need to adapt the workforce to technological change becomes an overriding necessity for governments. 'Perhaps', states the report, 'a high level of scientific and mathematical culture across the whole population may be a prerequisite for the nation to have a workforce capable of responding to the demand for the higher level of professional qualifications entailed by the rapid implementation of new technologies in the national economy' (OECD, 1981: 100).

Echoing rather belatedly the words of the House of Lords, which stated that society's relationship with science is in a critical phase (House of Lords, 2000), and consequently recommended a series of measures to remedy the situation, the European Union first endorsed this analysis and then recommended a general science policy, to be adapted by each State, with the explicit aim of making the European Community the first world economic power in its most recent Framework Programme[14].

Supra-national authorities like the OECD or the European Commission are, then, acting on several levels. They make possible a dialogue between nations which weakens the spectrum of specifically national regulations, particularly with the models for creating ministries for research; they highlight the integration of scientific policies and models of economic growth through

[14] To get an idea of how the European Union's philosophy has evolved, see the site dedicated to European research and innovation: ec.europa.eu/research/horizon2020/index_en.cfm, (consulted December 1, 2013).

innovation; they prescribe mobilizing populations through simultaneously training up a new generation of scientists who have internalized a new professional identity, a new work force, which is both competent and adaptable, and the conditions necessary for populations to accept the rhythms of change in their everyday life and professional surroundings. For example, Horizon 2020, the EU Framework Programme for Research and Innovation, is swarming with recommendations about communication, dissemination and involvement, around the top priorities of the research policy: excellence, societal challenges and industrial pre-eminence.

PUS Governance

Faced with these multiple convergences, at the moment we can observe a resurgence of political interest in science culture. Contrary to what happened in the 1980s, the undertaking now consists in framing the organizations and actors active in PUS for the sake of coherence and efficiency. Hence, the need for a governance that integrates the production of knowledge, its anchoring to economic development, and the involvement of populations. The expected new role of science communication is to ensure the adherence of the populations. Scientific communication is no longer destined to be an autonomous and relatively heterogeneous sector in which the actors are free to pursue their activities as they feel. It is now called for in the framework of an overall policy which intends to coordinate and integrate the actions undertaken. Indeed, it is now impossible to keep up with the changes made necessary by the model of economic development supported by constant innovation without ensuring the convinced involvement of populations who are unceasingly mobilised and caught up in a process of constantly accelerating change (Rosa, 2013).

And so it seems this new effort in favour of PUS basically aims to convince that the accelerating speed of social transformations brought on by the development in techno-science is legitimate. The whole thing is similar to a work of ideological persuasion aiming at rallying the population around the idea that the rhythm of progress in knowledge can only speed up; and that the outcomes of this knowledge, materialized in

technology and objects, will lead to transient frameworks of existence, forever imposing adaptation to new surroundings, themselves subject to constant reconstruction; and that controlling risk through science and technology is possible in a post-industrial society (Beck, 1996). It is a question of assuaging doubts aroused by the economic, social and societal consequences of the acceleration of techno-science.

How, in this context, can we imagine a possible autonomy of PUS as a research field? True, today it is not possible to consider it as an emanation of the discourse of scientists themselves, nor of the media, nor as a result of a social demand coming from the public. On the other hand, we need to take into account the role we intend it to play in an integrated governance of science policies, economic priorities and the implication of populations, together with the place it will occupy in a whole cluster of other trends, such as the rise in what is termed 'citizen science' and the transformations of social communications. It is certainly not a question of putting forward an umpteenth normative model, following on from a perpetually updated succession (deficit model, contextual model, dialogic model, etc.). The challenge and the difficulty are in escaping the temptation to put forward a new normative model. It is more a case of trying, despite all, to construct the object on the basis of all these apparently contradictory trends, independently of the determinations borne in the very idea of governance.

We are convinced that thinking PUS today is forcing us to think of different processes and objects in constant interaction with each other, and in the same movement, trying to connect them together. We need to remain mindful of public aspirations and in particular of the sturdy demand for a strong link between attitudes to science and democratic functioning. This strong link implies that we take into account the questions directed at researchers and politicians, even if that means re-thinking operating processes that are already well-integrated (decision-making upstream of projects, discussing economic development models, etc.), and respect the public's persistent confidence in science. We must also continue to pay close attention to the discourse and aspirations of scientists themselves, both in the research they conduct and in the debates they feel are needed and

in which they are prepared to get involved (as in the case of global warming or the protection of biodiversity). Finally, we must develop a critical vigilance with regard to the power of persuasion of systems of governance and their numerous channels of communication.

With this in view, it is obvious that the issues in scientific communication do not concern a purely empirical or technical approach. They concern democratic requirements.

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