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REGIMES OF KNOWLEDGE PRODUCTION IN SOCIETY: TOWARDS A MORE POLITICAL AND SOCIAL READING

ABSTRACT. The 'co-productions' of science and society have undergone dramatic changes in recent decades. However, contrasts between 'Mode 1' and 'Mode 2' are not compelling in historical terms. This essay will argue that, in fact, they offer too naturalistic and a-political a picture.

INTRODUCTION

The New Production of Knowledge, by Gibbons *et al*., and *Re-Thinking Science*, by Nowotny, Scott, and Gibbons, are significant books that try to characterize some of the decisive changes that have affected society, and the way that knowledge is produced today. They claim that the past few decades have witnessed the emergence of a new regime of knowledge production linked to a new regime of social regulations. Changes in society, as well as changes in the way scientific knowledge has been put to use, have radically transformed science with respect to its research practices, institutions, and epistemologies. In contrast to the archetypal (or classical) 'Mode 1' form of knowledge production, these books define a more recent 'Mode 2', which is progressively coming to dominate Western societies.

The publication of *The New Production of Knowledge* was followed by much stimulating debate – even if some revolved around what we might best characterize as 'interesting false problems'. The most notable of these is the question of continuity versus radical change – a question that historians and sociologists constantly encounter. On one hand, it has been argued that 'Mode 1' has never existed in a pure form; modern science, as a social institution, has always been of interest to political and economic powers, it has always been produced in a variety of social spaces (courts, universities, academies, military and engineering institutions, business, and popular contexts), and with various interests in mind. Epistemologically, reductionist approaches have always alternated (or have been developed in parallel) with holistic or mimetic alternatives; and claims that representations are realist have always been opposed to claims

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of mere model construction. On the other hand, nobody would claim that nothing decisive has happened over the past two or three decades; nor would anyone deny that a specific regime of 'co-production' of society and science (to adopt the vocabulary rightly advocated in *Re-Thinking Science*) has recently taken shape. My response to this particular question is that we could perhaps agree that the contrast between 'Mode 1' and 'Mode 2' may not be the most interesting contrast *in historical terms*; that the past four or five centuries have witnessed successive and heterogeneous *regimes* of knowledge production connected to particular social institutions and values; and that the problem now at hand is principally one of trying faithfully to characterize those regimes in their complexity and contradictions – in particular, the regime we are witnessing at work today.

The New Production of Knowledge has been criticized for being too general in its approach, interpreting local and emerging phenomena as universal, ignoring counter-tendencies and the unintended negative effects of positive moves; and perhaps too readily mixing descriptive and prescriptive considerations. Criticisms have also targeted the vocabulary used in the book, and what it seems to imply in terms of political values. In constructing its famous set of oppositions between classical 'Mode 1' and contemporary 'Mode 2' – an academic and disciplinary context for 'Mode 1' versus transdisciplinarity and the context of application for 'Mode 2'; peer evaluation, the relative autonomy and technicity of academic knowledge versus social relevance, responsibility, and reflexivity; hierarchical and stable structures versus egalitarian modes of evaluation and interstitial fluidity – the book might not only present too Manichean a picture, but also an overly-optimistic vision of the changes affecting science and society today. Whatever the merits of both books – and they are numerous – the authors may have underestimated the extent to which these transformations have been the results of political and social *choices*. This would mean recognizing that the developments they describe are not cases of *natural* evolution, which have simply to be identified and acknowledged, but are, rather, articulated with *alternative and conflicting* social, economic, and political projects. In cruder terms, by not sufficiently stressing the oppositions and the social forces at work, these books might tend to naturalize the process of change, and thus deprive social actors of the tools needed for criticism and the construction of alternative ways of managing society and science.

In this essay, I would like first to return to these questions, with the aim of proposing a complementary reading of the changes that have come about in recent years. In doing this, I will start by insisting on the historical dimension. I will take for granted, as suggested by *Re-Thinking*

Science, that we cannot study and understand changes in the way science is produced independently from changes taking place in society at large. I will then try to specify the nature of that 'co-production' today, questioning the determinations and dependencies at work; mapping the alternatives that have appeared and won, or simply disappeared, whilst remaining attentive to the variety of solutions that have been put forward. I will be considering the co-generation, the co-construction of various kinds of knowledge and social preferences, and the joint redefinition of both values and competences that allow such preferences to become instituted as norms. I will, of course, insist on the co-determination of new social orders and new modes and places of knowledge production, but will also underline the contradictory side-effects generated in the process, and will outline the ways in which conflicts are resolved.

SOME HISTORICAL CONSIDERATIONS

Let me start by proposing a quite banal idea: for at least the last five centuries, knowledge – be it 'pure' or applied, elaborated in universities or in other places – has been of crucial interest to power. Knowledge has been of interest in the form of gadgets and material techniques – arms, objects to be sold, tools to improve production; it has been of interest to the planning and management of military operations, social action, political control, or financial rewards; it has been decisive in the reproduction of elites and their cultural capital; and it has been central in offering new ideals and social goals, new ways of thinking about the world, nature, and society alike. My second idea, as banal as the first, is that it is essential to identify where knowledge has been produced and with which particular interests in mind. Knowledge and science are words that can easily mislead us into inappropriate generalizations if we do not load them with precise social and material configurations. As we know only too well, the fact that Galileo successively worked in a university, for the Republic of Venice, and at the court of the Grand Duke of Tuscany are of direct relevance to the kind of knowledge and argumentation he produced.

Since I have written in detail about such instances,[1] my discussion will be brief. I will present three examples of knowledge-generating activities taken from different periods to show how they were not only predicated on changes in the social order, but also significantly contributed to

[1] Dominique Pestre, 'The Production of Knowledge between Academies and Markets: A Historical Reading of the Book, *The New Production of Knowledge*', *Science, Technology and Society*, 5 (2), (2000), 169–181.

reshaping it. In the sixteenth century, practical (or mixed) mathematics was a well-recognized field of action that included astronomy and navigational science, surveying, cartography and geography, fortification and artillery, the design of mathematical instruments, and the publication of technical manuals. Above all, it was a response to the social, political, and economical changes of the Renaissance. It embraced many types of practitioners working for closed or totally-open markets, for state powers, private entrepreneurs, or companies (like the East India Company in a later period); and it was advocated as a model for the reform of natural philosophy that was accomplished during the seventeenth century. This set of activities did not disappear with the advent of the new natural philosophy, and its heirs could be found in the scientific instrument-makers who supplied the London market in the eighteenth century, in the 'ingénieurs-savants' in the first class of the French Academy (until the mid-twentieth century, predominantly military officers trained at the École Polytechnique) or in the French Army Geographical Service set up (initially around the subject of geodesy) in the last third of the nineteenth century.

In eighteenth-century Europe, we can find another example of such lasting 'knowledge for action' in the practice of natural history and agronomy. As Emma C. Spary reminds us, it is only from a present-centred perspective that we think of eighteenth-century natural history as 'pure knowledge'.[2] It was, on the contrary, organically linked with major social projects, as the acclimatization of exotic living organisms, which was seen as having great financial potential for states, entrepreneurs, and peasants; and with the moral reform of society as a whole. Natural history and agriculture were two aspects of the same enterprise aimed at the development of natural resources, the advancement of commerce, and the improvement of the nation's wealth. They were advocated and practised by the same people, both in the Jardin du Roi and on private estates (Buffon's property in Montbard, for example); and the same people served as experts to both landowners and the Crown. Natural history and agriculture also provided 'solutions to the problem of the moral and physical degeneration of the nation', a major concern of the time, 'and these sciences came to embody the concerns for social reform of many individuals who were later to be involved in the French Revolution'. Regeneration, liberty, and improvement were at the foundation of any Revolutionary act, 'and they were terms implying a natural and physical process of transformation in living

[2] Emma C. Spary, *Utopia's Garden: French Natural History from Old Regime to Revolution* (Chicago: University of Chicago Press, 2000).

bodies'. Here, too, we can detect a continuity running through eugenics and contemporary issues around genetic engineering.[3]

My third example concerns the large systems characteristic of late nineteenth-century and most of twentieth-century techno-science. This covers the whole of chemistry and pharmacy, the bio- and electro-technologies (bio-technologies have existed since at least the beginning of the twentieth century), radio, electronics, and the field of materials (completely reshaped as an industrial and academic field in the late 1950s, thanks to military expenditure), the control of space and oceans, the production and management of firms, and the invention of operational research and system analysis. In terms of institutions, this period witnessed the creation of the industrial research laboratory (with large-scale and recurrent oscillations between practical, direct development work and academic-style research). This period also witnessed the establishment of an infinite variety of relations between universities, state systems, the military, businesses, and local interests (from consultants to start-ups, from agronomic stations to the 'think tanks' of the Cold War). This period was also oriented towards a variety of goals and values (from making money to advancing pure knowledge, from reducing the suffering of mankind to eradicating Communism). In parallel, social regulations were adapted and transformed: new laws and jurisprudence concerning property rights were devised, new relations between experts took shape, and different forms of accountability were developed (in relation to the person who pays, to the state, to the 'public good', to local communities) with various scales of values linking them together. The variety of actors was very large indeed (inventors of any kind, amateurs contributing to advancing knowledge, scientists devoted to working-class culture and popular education, mathematicians developing instruments to rationalize management) and conflicts regularly arose between groups and projects (for social, political, or epistemic reasons). Tensions emerged between the actions undertaken by groups or individuals, with conflicts of interest sometimes appearing after events in which such actions had drastic results (for example, the academic physicist Paul Langevin was the main adviser to the French Navy when he asked soldiers to disobey orders during French military intervention against the new Soviet Union).

It is not my aim to accumulate examples of what it meant to produce knowledge over the last five centuries in order to deny the specificity of today's mode of knowledge production. I just want to draw attention to the fact that what Gibbons *et al*. and Nowotny *et al*. call 'Mode 1' cannot be accepted as an accurate characterization of *the knowledge economy* in the

[3] *Ibid*., 99–154, quotations on 125 and 152.

West since the sixteenth century. Without denying that the characterization of 'Mode 2' is stimulating and obliges us to think again about knowledge production, I want to repeat a simple and obvious point: that knowledge has always mattered tremendously to states and to economic elites; that most knowledge producers have always been attentive to the interests of those elites; and that science has always directly contributed to, and has been a major resource for, changes in social ideologies. I am not saying that ' "Mode 2" has always been there' – I am saying that each moment exhibited a particular combination of the elements that are claimed to characterize 'Mode 2', even if new elements constantly enter the picture and are redefined.

I also would like to insist on a point which is obvious to any historian – that a process of *nationalization* has happened to science over the last 150 years.[4] By this, I mean that science has become so central to national security, economic development, and identity, that it has become part of the normal duties of any state. This has been the case with the ever-expanding financing of secondary and higher education, directly in Europe and indirectly in the United States; with the financing of major sectors of research (like George W. Bush's anti-missile project); with the creation of national laboratories since the Physikalisch-Technische Reichanstalt in Berlin; with large co-operative projects like the genome project; and with prominent companies working in the national (and their own) interest. Although this process of nationalization started during the modern period (the Colbertian mode of managing techno-science and society in France comes to mind, but parallel examples could be given for Britain, notably with respect to its navy), but it was at its height during the Cold War (notably in the United States) – *and is still largely with us*. Again, I am not saying that the place of the state in the business of science has always been the same; I am saying that it has been central and is still decisive today, notably in the most powerful nations of the world. National political representatives have been long-standing players in the business of science, and major interest groups rarely hesitate to ask them to intervene to protect their interests whenever there is a perceived need (just think of the reasons given by the Bush administration for refusing to ratify the Kyoto protocol).

[4] The phrase is taken from David Edgerton, 'Science in the United Kingdom: A Study in the Nationalization of Science', in John Krige and Dominique Pestre (eds.), *Science in the XXth Century* (Amsterdam: Harwood, 1997), 759–776.

CHANGES IN SOCIETY AND R&D OVER RECENT DECADES

Let me now turn to today's situation. I will not repeat the often-illuminating analyses made by Nowotny *et al*. and Gibbons *et al*. (notably in *Re-Thinking Science*), but will rather concentrate on the aspects that I find lacking in this treatment, stressing in particular the tensions at work during the last three decades. I would like to emphasize two aspects of contemporary society as being particularly important: (1) the reassertion of power by big business and financial capital, resulting in the reversal of many processes of social protection that have taken a century and a half to develop (this phenomenon of re-privatization and its social consequences are clearly visible in the countries of the South but also in most societies in the northern hemisphere); and (2) the emergence of new, influential social groups (generally composed of younger, educated people), which have developed new values and modes of social action. This has meant that other ('lower') social groups and interests have lost visibility, and that the norms of social justice and identities have changed. In the next section, I want to lay stress on two other elements of our relationship to 'nature': first, that today techno-science increasingly puts the possibilities it opens up into practice before assessing the potential risks they imply. In today's *risk society*, things are done (and perhaps have to be done) prior to an analysis of their long-term consequences. As Ulrich Beck writes, 'inspection follows realization, production takes place before research';[5] second, the tendency of business to be systematically 'environmentally rapacious' (to use Partha Dasgupta's words) has been dramatically reinforced.[6] This situation is not without importance in the recent social mobilization against 'globalization'. What follows is a more detailed exploration of these ideas.

I will start with Luc Boltanski and Eve Chiapello's recent book, which partly comes back to Weber and Marx in trying to characterize the new 'spirit' and practices of late twentieth-century 'capitalism'.[7] Their approach involves studying management theories and social relations at the level of production. Their conclusion is that, starting in the 1970s, capitalism has undergone a dramatic transformation – an idea that is also present in the notion of 'Mode 2'. What Boltanski and Chiapello add to the picture is this: confronted by the major social movements that

[5] Ulrich Beck, 'De la société industrielle à la société du risque', *Revue Suisse de Sociologie*, 19 (1993), 311–337.

[6] Partha Dasgupta, 'Science as an Institution: Setting Priorities in a New Socio-economic Context', *World Conference on Science, Science for the 21st Century, A New Commitment* (Paris: UNESCO, 2000), 264–271.

[7] Luc Boltansky and Eve Chiapello, *Le nouvel esprit du capitalisme* (Paris: Gallimard, 2000).

characterized the years 1965–1975 (and the difficulty of efficiently running factories, notably in Europe), and wanting to restore productivity and the distribution of incomes in favour of 'Capital' (versus 'Labour'), managers and 'think tanks' (for example, those set up around Ronald Reagan) came up with the idea that it was imperative to reverse an undesirable historical trend by replacing the welfare state with another regime of social and political regulations. This meant not only recomposing many social institutions, but also instilling new ideals, and introducing a new appetite for individual action and rewards – in short, reinventing a strong set of neo-liberal values. Managers started with new organizational principles for the workforce inside firms, with new methods of managing production (the end of 'Fordism'), and eventually ended up with a new vocabulary and a new 'form of life', with new definitions of social justice and 'good conduct', and with new 'prescriptions' governing the rewards for and accountability of employees. Boltanski and Chiapello call this new set of social values *la cité par projet*, a set of norms whose main catchwords are networking practices, autonomy, and creativity freed from hierarchies, mobility, and adaptability.

The elements that facilitated this change included the economic crisis and the rise in unemployment that prevailed from the mid-1970s to the mid-1990s, and the growing place occupied by highly-educated people and their values in the Western world. In framing their new world, managers relied upon the values of the generation that had been responsible for the various 'May 68' movements, and recycled their goals – desire for autonomy and control over their lives, and rejection of authority – into new management tools.[8] A third element was the process-like nature of this change, with the unforeseeable consequences that accompanied it – the renewed dominance of financial capital over industrial capital being just one example. A further element was the emergence of new techniques, such as those of information and communication, which helped to rationalize the organization of production. While this meant giving more autonomy to some people, it also introduced new forms of alienation for others. The net result was a reversal of historical trends initiated in the nineteenth century towards recognizing the legitimacy of workers' protection. A new 'spirit of capitalism' arose, with a new vision of what societies and communities are or should be, with a new international division of

[8] The relations between the emergence of that new educated middle-class and the deployment of neo-liberalism, and between the values of that new class/generation, the new 'spirit of capitalism' (and perhaps postmodern discourses) are complex, fascinating, and cannot be easily described. Let me just note that neither is 'the origin' or the cause of the other, nor are they independent variables. They were all decisive in making up today's world – which does not mean they cannot oppose each other.

labour, entailing the degradation of the social situation of large segments of the population. Just think of the working conditions of most women, traditionally a poorly-protected part of the workforce.

Because of the importance of these issues for Gibbons *et al*. and Nowotny *et al*., I also want to say something about scientific research and research and development (R&D), the shifts in locations and structures of research, and the consequences of these for the type of knowledge produced. Trends in the new invention-based economy are well characterized in Gibbons *et al*. and Nowotny *et al*. (new institutional 'compatibilities' between public, semi-public, and private efforts, a greater variety of collaborative solutions, and more rapidly moving and adaptive structures). What I want to do is to show the limits, interests, and contradictions at work in this transformation. First, I would stress that it was in the wake of stronger international competition (notably, that experience in the US *vis-à-vis* Japan in the 1970s and 1980s), and the emergence of a more powerful financial capital sector (and the constant preoccupation with quarterly returns that this entails), that drastic cut-backs affected industrial research, and managers placed increasing emphasis on developing more elaborate connections between firms and markets. To use local parlance, the dominance of 'market pull' reasserted itself over 'technology push', and profound reorganizations (perfectly documented in Buderi's *Engines of Tomorrow*) took place in the R&D departments of most companies.

I would like to add three observations concerning these well-known developments: first, these moves (between a logic of development based on the differentiation of products and short-term projects on the one hand, and a more autonomous logic of laboratory research and R&D on the other) were 'business as usual' – just think of the German chemical industry in the late nineteenth century where schemes were regularly devised to more effectively integrate research and sales, clients' demands, and technical proposals.[9] Second, a movement in the opposite direction (reasserting the necessity of long-term investments) had already begun in the US in the late 1990s – as illustrated by the 1998 National Innovation Summit held at MIT in the presence of Vice President Al Gore.[10] Third, government programmes and public agencies played an active role in fostering inter-company alliances in order to collectivize risks and fundamental research, and state money was readily made available to help.

In the light of these reasons, we have to be careful neither to essentialize the changes that took place between 1975 and 1995 (which the notion

[9] See Robert Buderi, *Engines of Tomorrow* (New York: Simon and Schuster, 2000), 122.

[10] *Ibid*., 124–125.

of 'Mode 2' runs the risk of doing), nor to assign them too positive or unequivocal a meaning. More precisely, as Dominique Foray notes,[11] this kind of new 'knowledge-based economy does not automatically lead to an open system of exchange and cooperation', which should come as no surprise since its logic owes a great deal to intensified competition for the control of markets and profits. Changes at the individual level can end up with contradictory effects at the global level. At the macroscopic level, the net result might be an increase in highly-*secretive* practices, legal battles for a larger *appropriation* of results by private and corporate interests, and a tendency to construct *monopolies* for products and future research – a set of outcomes that needs to be debated outside the mere confines of company board rooms, courts, and associated governmental circles. This is one source of the discontent that has led to the protests around recent meetings of the World Trade Organization (most notably in Seattle), and the summit in Genoa in July 2001.

A concrete example might be illuminating. Let us consider a study by Maurice Cassier and Jean-Paul Gaudillière concerning the genetics of breast cancer during the past decade in France and the US.[12] In this study, the authors identify conflicting modes of research with their associated moral economies, rather than with a single new mode overcoming the other. This is important not only because it shows that debates are at the same time technical, organizational, and political; but also because it reveals alternatives and demonstrates that social choices are at stake. The first mode is organized around the emblematic and much-admired figure of the scientist-entrepreneur, reflecting new American laws concerning the patenting of genes, and the trend towards insurance companies managing medical care. For these scientists, the best social and medical solutions emerge from commercial operations in a free market, with *Myriad Genetics* providing a good example. Other effective modes of research rely more upon a connection between public research and patients' associations (as in the case of Marie-Claire King, at the University of California, who identified the first gene associated with a predisposition to breast cancer in 1990); or on hospital-based practices of the clinical profession in a public social security system (as in France). These three modes imply different types of networks and social values, and the Cancer Research Campaign patented their works to preserve *the public accessibility* of genes against

[11] Dominique Foray and Bengt Ake Lundvall, 'Une introduction à l'économie fondée sur la connaissance', in B. Guilhon, P. Huard, M. Orillard, and J.B. Zimmermann (eds.), *Économie de la connaissance et organisations* (Paris: l'Harmattan, 1997), 16–38.

[12] Maurice Cassier and Jean-Paul Gaudillière, 'Recherche, médecine et marché: la génétique du cancer du sein', *Sciences Sociales et Santé*, 18 (2000), 29–50.

Myriad Genetics. More precisely, this campaign has fought for a reversal of the American patent laws on living entities (and for its limitation in the European context), and opposes the definitions of what may be patented that appear too wide (some refuse any possibility of patenting genes at all). They also contest the constitution of commercial monopolies in the health sector, and petition for public rules to assess the clinical utility and quality of tests, as well as their social use. Thus, while most biotechnology companies oppose any intervention by the Food and Drug Administration on these questions, the Breast Cancer Coalition and many academic geneticists and specialists of public health support it. Clearly, different arrangements and regimes co-exist, and there is no obvious hegemony (or evidence of superiority) of one mode of production (of knowledge and society) over another, and the questions remain largely of a political nature.

THE RISK SOCIETY: EXPERTISE, PUBLIC DEBATE, AND POLITICS

This last example leads me to comment on what Ulrich Beck first called the 'risk society'. This debate has become politically central in the past decade, and a growing demand for social accountability has surfaced in many parts of the population. This has arisen because science – or more precisely, the techno-industrial world to which scientific knowledge is linked – has the power to dramatically and often irreversibly alter our lives. Here, I am thinking of the biotechnologies in agro-business and medicine, in securing the environmental equilibrium of the planet, and in reproductive technologies. A characteristic feature of the techno-scientific industry is that it cannot anticipate the consequences of what it modifies and displaces in nature and society before it does so. Second, a series of major global crises has taken place during the last two decades (notably in Europe), which have profoundly altered people's confidence in existing social regulations. In the case of France, we could cite AIDS, the blood-transfusion scandal, the BSE epidemic, the carcinogenic threat of asbestos, and recurrent debates about global warming. These highly-publicized events have led to heightened sensitivity concerning techno-industrial productions, leading to demands for moratoria and better analyses of possible risk.[13] Third, political authority has been blurred, owing to the expanding role of the European Commission in Brussels. More broadly, globalization has

[13] Note here that the concrete and precise unfolding of events, in each local situation, is the key to understanding local attitudes. In the 1970s and early 1980s, an opposition to Genetically Modified Organisms (GMOs) was notable in the US, but non-existent in France, while twenty years later, the reverse is true – largely because of the succession of 'crises' that have affected France.

been accompanied by new forms of regulation, which means that political regulation established by elected bodies is either substituted or undermined by court rulings and decisions by non-elected bodies like the World Trade Organization (WTO).

Rightly, Gibbons *et al*. and Nowotny *et al*. insist on the fact that expertise is now 'socially distributed', and that 'we are all experts now'. There are numerous examples of the growing capacity of laymen to become experts.[14] Yet, we need to bring out some of the tensions that arise from this phenomenon. Some of the questions that need to be investigated are: How best to organize distributed expertise when regional or international regulations are at stake, or when fundamental ideals are invoked, such as when alternative modes of agricultural production (non-productivist organic agriculture) are pitted against the introduction of Genetically Modified Organisms (GMO)? How should the distribution of expertise work, and in whose interest, since we know only too well that major economic interests are involved, that power relations matter dramatically, and that these power relations are distributed asymmetrically? And how are we to articulate such distributed expertise with political legitimacy, with conflicting definitions of social justice; and how can we avoid having the role of experts pre-empted too easily by, and for the benefit of, the new middle class, rich in cultural capital?

To start with, I would remind the reader that expertise is not a neutral political entity. The control of expertise is a major political bargaining chip; it implies the definition of collective and individual norms, and it directly impinges on key interests. In the world of *Realpolitik*, it is banal for those in positions of power to use all the means at their disposal to avoid opening an independent process of expertise, or to develop diversionary strategies.[15] Let me take the example of the commercial logic at work in environmental issues. According to Dasgupta, markets are not the most adequate institutions for protecting the environment. The structural reason is that they 'cannot be relied upon to provide us with prices which would signal true environmental scarcities'. Environmental natural resources are considered free by techno-industrial interests (or are consistently undervalued when businesses are forced to take their value into account), and there is little incentive to economize their use. Thus, market forces are

[14] Michel Callon, 'Des différentes formes de démocratie technique', *Annales des Mines, Responsabilité et Environnement*, 9 (1998), 63–73, presents several cases in an interesting interpretative frame.

[15] Ulrich Beck has regularly stressed this point. The fashionable rhetoric of *governmentality* used by institutions today may constitute another good example of such strategies.

going to be satisfied as long as there are available resources, whatever the longer term consequences.[16] Conversely, if we believe Dasgupta is right, it may be essential to join ecologists (and economists) who have recently urged public authorities to help them constitute groups of experts to estimate 'the value of ecosystem services', and have argued for changes in the relevant regulations.[17] In the same way, the question of which institutions should have the power to sanction expertise and its uses is decisive. While it is very good that 'Science moves into the Agora' (a claim from *Rethinking Science*), deciding on the precise forum for each question is of the utmost importance. One good example is the *Codex Alimentarius* and the new function it started to fulfil when the WTO made the Codex *the scientific reference* for international commercial law. Established in 1962 by the World Health Organization and the Food and Agriculture Organization, the *Codex* was intended to provide minimal safety norms for food, while governments and other organizations were free to have stricter rules. Since its instrumentalization by the WTO, the norms fixed by the *Codex Alimentarius* have changed their meaning. They now *de facto* define what can be demanded in terms of a product's quality as the standard for international trade; and stricter rules can now be declared unfair trade practice. It is in this context that the US has argued that stricter norms elaborated by the European Community concerning the use of hormones in cattle breeding should be sanctioned. Again, if we believe, as citizens, that the rule of the WTO is detrimental to our health and freedom, we must recover the means to redefine the legitimate place for the exercise of that expertise.

Conflicts of legitimacy are also unavoidable: 'to behave democratically', and 'to have an open and accountable expertise', can both be interpreted in different ways. Elected bodies can claim they are legitimate when defining norms and rules (what, for example, would be permissible in terms of pre-natal genetic testing in order to avoid eugenic practices). They might consider it part of their mandate to devise the appropriate administrative procedures and create bodies in charge of ensuring that the law is properly implemented. Elected bodies could also claim legitimacy to intervene directly in research. There are many contemporary cases. For example, as population geneticists in agronomy explain, competition with agro-business is profoundly unequal. Monsanto and other large companies have thousands of people working to produce one new GMO

16 Dasgupta, *op. cit.* note 6.

17 Actions of this kind have already happened in California, for example. Cf. Ulrich Beck's work on the necessity of legally redistributing the obligations in terms of proofs. *Risikogesellschaft* (Frankfurt: Suhrkamp Verlag, 1986), notably, ch. 7.

after another, products they want to put on the market as quickly as possible. On the other hand, there are only a few dozen population geneticists trying to assess the effects of these new GMOs in the field, and they require many years to come up with experiments that they can consider harmless for the environment, and to produce meaningful conclusions. If elected bodies consider it safer to wait for conclusions to be reached before allowing GMOs to be made available, public money must be made available to sustain this kind of research as, in general, private interests will not fund it. Other forms of democratic control could be and have been developed in parallel – notably, ones geared towards more local problems. Examples are numerous and I will mention only the case of the long-standing arrangements that exist between farmers' co-operatives, professional organizations, and agro-business companies in France. The functions of these local networks, which can be found in the production of *grands crus* wines or in mountain cattle-rearing, are to regulate conflicts between individual and collective interests, to establish quality-control standards for products or processes, and to produce and validate new knowledge. Such a network, for example, funded and organized the (ultimately successful) research needed to combat the corn borer pest.[18]

Another key question to be asked is who benefits from expertise? By default, the groups that profit most from changes in expertise are the new educated middle classes (in French political parlance, 'bourgeois – bohême' or 'libéraux – libertaires'). Their early participation, in many forms of debate, and their invention of new forms of expertise, have been very positive. In blazing new trails, they have offered examples that have modified social and political equilibria. Nevertheless, they have defined problems, priorities, and norms of justice in their own way – which is natural enough, but which might have been detrimental to other groups of citizens, or to other countries or regions of the globe.[19] It might very well be that, as Daniel Kleinman writes, 'the obstacles to [radically] democratizing science within the existing social order are formidable', but 'there are a range of possible strategies that would increase the likelihood that these obstacles can be at least partially surmounted'. He details the interesting examples of AIDS research and popular epidemiology, but other experiments are under way in the societies of the North – a reading of Sclove's *Democracy and Technology*, or a visit to the web site of the

[18] This paragraph is largely inspired by Armand Hatchuel, 'Agir public et conception collective: l'expertise comme processus démocratique', forthcoming in E. Heurgon and J. Landrieu (eds.), *Pour une expertise démocratique* (Paris: Éditions de l'Aube).

[19] A subtle criticism can be found in Bernard Kalora, 'Global Expert: la religion des mots', *Ethnologie Française*, XXIX (1999), 513–527.

Loka Institute provide stimulating examples – as well as in the relationship between 'North' and 'South' – the rights of indigenous populations, for example. As for academics, we might contribute to this move (the suggestion is Kleinman's) by proposing that 'cooperation with citizen groups be recognized as part of the service component considered in tenure', and that it be considered in the same favourable light as any collaboration with industry.[20]

Expertise is thus not first and foremost a technical question. Neither is it a matter of identifying as perfect a procedure as possible. This does not mean, however, that formal rules are not crucial, and I want briefly to evoke the most commonly-proposed principles for organizing expertise.[21] My intention is not to be systematic, but to insist on some of the tensions, perverse effects, and contradictions that can be generated by the implementation of these principles. Let me start with a principle that is regularly invoked, the independence of the expert.[22] In matters of principle (and principles matter), the idea is crucial, but we know it is rarely applicable since good expertise is gained through working *in contexts*, and since independent, or objective (or simply shared) knowledge is not so common. As an intention or a principle, however, independence is a key goal, and procedures must try to impose such *an attitude* (the expert must justify his or her recommendations, he/she must declare his/her links with interests, and he/she should be dismissed if he/she does not respect certain rules).

A second oft-cited principle (more in line with *Realpolitik* since it is sceptical about people's good wills) is to have a formally-organized confrontation between experts. Modelled on cross-examination in court, however, this method has severe limitations when applied to social dynamics. When applied to local situations, it may easily disrupt social relationships, tending to exacerbate and polarize positions, and thus obstruct the ultimate goal: the emergence of a new consensus, of a compromise.[23] Thus, although this principle is central, it needs to be implemented

[20] Daniel Lee Kleinman, 'Beyond the Science Wars: Contemplating the Democratization of Science', *Politics and the Life Sciences*, 16 (2), (1998), 133–145.

[21] One example among thousands is provided by Pierre-Benoît Joly, 'Besoin d'expertise et quête d'une légitimité nouvelle: quelles procédures pour réguler l'expertise?', *Revue Française des Affaires Sociales*, 1 (1999), 45–52.

[22] To give just one reference, Marie-Angèle Hermitte, 'Pour une agence de l'expertise scientifique', *La Recherche*, 309 (1998), 95–97.

[23] For a stimulating critique, see Hatchuel, *op. cit.* note 18. He notes that cross-examination might be, in certain circumstances, socially destructive, in that it tries to invalidate the testimony and undermine the credibility of the opposing party.

in such a way as to help the expert process become a learning process for all the parties concerned.[24]

There is also a third principle: have lay people be full members in the process, from the beginning, and have them directly contribute and co-produce expert knowledge. The ideas that lie behind this principle are that knowledge benefits by being tackled from various angles; that collective elaboration outside the confines of academic or industrial science is a guarantee of plurality and promises a better social outcome; and that the point of the exercise is not just to have a pronouncement of true scientific knowledge and then work to have this 'understood' by ordinary people. Implementations of this principle can be seen in consensus conferences, citizen's juries, public hearings, and patient interest groups. Note, however, that each solution leads to different relationships with political or professional authorities, or with formal decision processes; and so behind the formal process itself, it may be essential to reserve an acknowledged place for political contestation and the intervention of outside activists. Thus, a last principle might be: consider contestation as both normal and good, as this is perhaps the essence of an ever-improving distribution of expertise.

It is time to conclude. I hope to have succeeded in what I set out to do, namely to add another layer of complexity on top of the stimulating proposals made by Gibbons *et al*. and Nowotny *et al*. More precisely, my objective was to stress the importance of making explicit the role of social interests in the reconfiguration of society and modes of knowledge production; to show, consequently, the variety of political choices and organizational arrangements that have been, and can be devised, with their advantages and limitations; and finally, to show that tensions and conflicts between different 'moral economies' are normal, that they should be identified, and that solutions should be locally imagined and constructed to enable the emergence of alternative ways of managing our lives.

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[24] On the notion of expertise as a learning process, see Pierre Lascoumes, 'Productivité des controverses et renouveau de l'expertise', text of a conference given in January 2001, and to be found on the Centre Alexandre Koyré web site (*www.ehess.fr*).

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