

## Power and Knowledge: The politics of the knowledge society

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### Abstract

The future of democratic societies is at stake in the manner we articulate the legitimacy of their decisions and the cognitive competence with which those decisions are taken. Nowadays this requirement clashes with the drawback that there is an indomitable dimension of ignorance that cannot be eliminated but rather needs to be managed. The experts' advice increasingly takes on board these 'unknown unknowns', whereby the relationship between science and politics has become just as necessary as it is complex.

### Keywords

Knowledge society, non-knowledge, political advising, risk, science and technology

It is a well-known fact that, in knowledge societies, knowledge is not only a support for economic productivity, it also plays an increasingly important role in the social legitimation of political decisions. Scientific reports, studies, and expert commissions are now part of our habitual political and social landscape. We must also continue to increase the amount of knowledge transferred between the social sciences and government institutions. Nevertheless, if we are to understand how knowledge and power are currently expressed, we must consider the fact that the status of knowledge has changed; it is no longer cloaked in the traditional signs of authority. Nowadays, therefore, (1) knowledge is not the exclusive product of experts, but is more often a social construct, and (2) knowledge is increasingly accompanied by an awareness of its limitations and the growing body of non-knowledge that inevitably accompanies it. By 'non-knowledge', I am not simply referring to a lack of knowledge, but to Ulrich Beck's very specific conceptualization of that term, which I will address presently. It is in this new context that governments will have to cope with their felt need for knowledge.

The conditions under which politics operates today can be summarized by saying that 'facts are uncertain, values in dispute, stakes high and decisions urgent' (Ravetz, 1999: 649). The problems generated by risk are redefining the boundaries between science, politics, and public opinion. Competing expert opinions, the questionable scientific assessment of risk, and the threatening potential of scientific innovations have led us to challenge the traditional image of science as an authority that provided reliable, objective knowledge with universal validity. Science increases knowledge, of course, but it also increases society's uncertainty and non-knowledge.

The relationship between knowledge and power is largely paradoxical nowadays. We ask science to make relevant knowledge available in order to help us make important collective decisions. At the same time, there is less confidence in science or at least a restructuring of its traditional role as an indisputable provider of unquestionable knowledge. The Eurobarometer survey of 2005, 'Social Values, Science and Technology', reveals that science is more trusted than other social institutions, but confidence in the objectivity of scientific experts is a thing of the past. To put it more controversially: 'In a knowledge society, the significance of knowledge increases, but the relevance of science decreases.'<sup>1</sup> A knowledge society is one in which knowledge, rather than science, is afforded great significance. We cannot fully understand a knowledge society without considering the fact that, in its functioning and its conflicts, it encompasses many different types of knowledge, some of them contradictory. That is why knowledge politics must become the politics of the diversity of knowledge (Willke, 2002: 12), and the processes of interpretation and negotiation must embrace a wide range of people and places.

At the same time, we can see what Jasanoff has called a 'peripheral blindness' in modern states, privileging what is known at the expense of the unknown, relying too heavily on their image of reality, focusing on the short term, paying more attention to immediate risks than to indeterminate, synergistic, or long-term risks. From this point of view, we could say that our principal demands on politics can be summarized by a cognitive imperative that persists in spite of our understanding that the instruments used by politics to comprehend reality clearly leave room for improvement. Learning has become the true objective of civic deliberation. 'The capacity to learn is constrained by limiting features of the frame within which institutions must act. Institutions see only what their discourses and practices permit them to see' (Jasanoff, 2005: 386). If that is the case, the question of how to rethink the relationship between knowledge and power is a crucial issue for contemporary democracies.

Using this as my starting point, I intend to analyze how best to comprehend the politics of knowledge, the governance of knowledge through knowledge (Schuppert and Voskuhle, 2008). This study will, in other words, address the forms and processes in which the conflicts and risks caused by the knowledge and non-knowledge of science are socially defined, negotiated, and configured. Its setting is the public space, the hybrid agora where science and society, politics and the marketplace converge (Nowotny et al., 2004: 253). By examining this collective question, we can judge whether politicians and public institutions have at their disposal the knowledge they need in order to make decisions. It is important to remember that part of the legitimacy of their decision-making stems from their promises to act rationally. In other words, they must know what they are doing when they prohibit smoking in public places, for example, or when they determine educational curricula or decide to introduce a particular vaccine. The development of the welfare state has made the need to base decisions on a

systematic elaboration of knowledge even more urgent.

## **Non-knowledge in knowledge societies**

Those who wish to act rationally need the particular knowledge to do so. The state has always sought to be a rational actor. As Norbert Elias (1997) so eloquently claims, the emergence of the modern state is associated with the configuration of key monopolies, particularly the resources of government that were indispensable in the early days of modernity, such as force, law, and authority. All these resources also include the efficient use of knowledge.

It is important to clarify the nature of the knowledge the modern state believed it possessed. The knowledge political institutions wielded was viewed as truthful and progressive, so the axiom ‘knowledge is power’ (Bacon) made perfect sense. This is no longer the case, and there is no point now in expecting science to supply politicians with objective knowledge on which to base and legitimate political decisions. In addition, the nature of knowledge, our conception of science, and the meaning of political advising have changed significantly over time.

Knowledge societies have transformed the idea of knowledge so radically that one might rightfully now call them ‘ignorance societies’. In other words, these are societies that are increasingly aware of their store of non-knowledge, and they make progress not by increasing their knowledge but by learning to manage various forms of ignorance: doubt, probability, risk, and uncertainty. There is uncertainty about the risks and consequences of our decisions, but also about rules and legitimacy. New and diverse forms of uncertainty are appearing; these refer not just to that which is not yet known, but also to things that cannot be known. We cannot generate appropriate knowledge for every potential problem. A small part of existing knowledge is supported by unquestionable facts, but the rest of it depends on hypotheses, premonitions, or circumstantial evidence.

This return to uncertainty does not mean that contemporary societies depend less on science. Quite the opposite. Their dependence on it is greater than ever; what has changed is both the content and the institutional organization of science and knowledge. For some time now, more and more attention has been given to a series of things that could be understood as ‘the weakness of science’: uncertainty, contextuality, interpretive flexibility, non-knowledge. At the same time, the problems we are confronting are different, thus changing the type of knowledge we need. In many areas (such as the regulation of the marketplace or environmental issues), we must resort to theories that make use of models of probability but have no precise long-term forecasts. When it comes to the most serious issues affecting nature or the fate of humankind, we face risks for which science provides no definitive solution. What science does is transform ignorance into doubt and uncertainty (Heidenreich, 2003: 44). Science is in no position to

free politics from the responsibility of having to make decisions under conditions of uncertainty.

Even though the sciences have helped to greatly expand the reliable knowledge, when it comes to highly complex systems such as the climate, human behavior, the economy, or the environment, it is becoming increasingly more challenging to obtain causal explanations or accurate predictions because our cumulative knowledge also brings to light the infinite universe of non-knowledge. This process of the weakening and pluralizing of knowledge is probably what is behind the crisis in politics and the erosion of state authority. We will not be able to recover knowledge's ability to configure the world until we manage to reformulate power alongside the new forms of knowledge. A society of risk demands a culture of risk.

Modern society has long relied on being able to adopt political and economic decisions on the basis of rational and socially legitimated (scientific) knowledge. Persistent disputes about risk, uncertainty, and non-knowledge, as well as the continuous infighting among experts, have increasingly and irreversibly destroyed this confidence. Instead, we are aware that science fails to produce unequivocal advice. Consider, for example, risks related to health or the environment, which can generally only be identified with great uncertainty. This is why decisions about these matters must not depend on scientific knowledge as much as on a justified, rational, and legitimate handling of ignorance.

The knowledge model that has been in use until now, was naively cumulative; the assumption was that new knowledge could be added to previous knowledge without undermining it, thereby gradually diminishing the boundaries of the unknown and increasing the calculability of the world. But this is no longer the case. Society's dynamic principle is no longer a continuing increase of knowledge and a corresponding decrease of the unknown. There is an entire set of non-knowledge produced by science itself, a 'science-based ignorance' (Ravetz, 1990: 26). This non-knowledge does not stem from a temporary lack of information, but is the result of the advancement of knowledge. That very non-knowledge (regarding the consequences, scope, limits, and reliability of knowledge) is increasing at a more than proportional rate (Luhmann, 1997: 1106). If the dominant means of combating ignorance used to demand eliminating it, the current approach assumes that there is an irreducible dimension to ignorance. Thus, we must understand, tolerate, and even make use of ignorance, viewing it as a resource (Smithson, 1989; Wehling, 2006). We have one example in the fact that in a knowledge society, the risk posed by 'confidence in other people's knowledge' has become a key issue (Krohn, 2003: 99). Knowledge societies can be specifically characterized as societies that must learn to manage this ignorance.

The boundaries between knowledge and non-knowledge are neither

unquestionable, obvious or stable. In many cases, questions about how much we can still know, what can no longer be known, or what will never be known are still unanswered. This has nothing to do with the typical Kantian humility about how little we know and how limited is the scope of human knowledge. It is less precise than Merton's 'specified ignorance', which focuses on weak forms of ignorance, such as the ignorance that is assumed or feared, the ignorance of not knowing what we do not know or the extent to which we do not know. We are often ignorant about what might happen, but also even about 'the area of possible outcomes' (Faber and Proops, 1993: 114).

The appeal to 'unknown unknowns' that are beyond the scientifically established hypotheses of risk has become a powerful and controversial argument in social debates on new research and technologies. Of course, it is still important to expand the range of expectation and relevance so as to distinguish the areas of non-knowledge that we had not known until now and to begin discovering 'unknown ignorance'. But this goal should not make us slip into the fantasy of believing that the problem of unknown unknowns can be resolved in a traditional manner, such as making it completely disappear through more and better knowledge. Even when the relevance of unknown unknowns has been explicitly acknowledged, we still do not know what is not known and whether anything that is unknown is crucial. Knowledge societies have to accept the idea that they will always need to face the issue of unknown unknowns; they will never be in a position of knowing whether or the extent to which the 'unknown unknowns' they are necessarily faced with are relevant.

As Ulrich Beck cautions, this 'time of side effects' is characterized not by knowledge, but by non-knowledge (Beck, 1996: 298). This is the real social battleground: those who know and those who do not, and the ability to recognize and challenge knowledge and non-knowledge. If we look closely, the most important political confrontations nowadays stem from distinct assessments of non-knowledge or the uncertainty of knowledge. Society disagrees over appraisals of fear, hope, illusion, expectations, confidence, crises, none of which have an indisputable, objective correlation. The effect of this controversy is to place emphasis on those dimensions of non-knowledge that accompany the development of science; on its unknown consequences, issues that are left unresolved, limitations on validity, and so on. These controversies generally revolve not around knowledge itself, but the non-knowledge that inevitably accompanies it. When people discuss contrary or dominant knowledge, this is precisely what they are doing: 'drawing attention to ignorance' (Stocking, 1998), emphasizing the things we do not know.

This 'politicization of non-knowledge' (Wehling, 2006) has, for example, become apparent within the framework of disputes on technology policy that have taken place since the 1970s. Not only did we become more aware of the importance of the unknown, but this perception and its corresponding assessment

became increasingly more disparate. What essentially inspired fear in some people inspired high expectations in others. While some people spoke about a short-term cognitive deficiency, others argued that there were things we could never know. This all took place at a time when we were realizing that science produced not only knowledge but also uncertainty, 'blind spots', and non-knowledge. The fears and anxieties that flavor a good deal of public opinion are not entirely unfounded, as advocates of zero-risk technology tend to assume. Behind society's rejection of some technical options, there is often a perception of a particular uncertainty or lack of knowledge that science and technology should acknowledge. In this and other similar conflicts, divergent and even incompatible perceptions of non-knowledge collide.

From this point forward, our biggest dilemmas will revolve around 'decision-making under ignorance' (Collingridge, 1980). Making decisions under ignorance requires new forms of justification, legitimation, and observation of consequences. How can we protect ourselves from threats against which, by definition, we do not know what to do? And how can we do justice to the plurality of the perceptions of non-knowledge if we do not know the scope and relevance of what we do not know? How much non-knowledge can we afford without unleashing uncontrollable threats? What ignorance should we consider relevant and how much can we ignore as harmless? Which balance between control and chance is acceptable in terms of responsibility? Concerning what we do not know, is it a *carte blanche* for taking action, or conversely, a warning that maximum precautions should be in place?

Societies confront non-knowledge in different ways. From a social standpoint, they react with disagreement. From a temporal standpoint, with provisional understanding. From an objective standpoint, with imperatives to try to prevent the worst case scenario (Japp, 1997: 307). Consider the case of the 'precautionary principle', now a part of European Union treaties and international agreements such as the Rio Declaration on Environment and Development. These agreements suggest that there should be no delay in the adoption of efficient measures to avoid serious, irreversible damage such as climate change, even though the scientific evidence is not complete. However, the precautionary principle remains a controversial rule with widely divergent interpretations. In any case, such an approach is interesting insofar as it explores the consequences of certain decisions, the likelihood a particular type of destruction will take place, the criteria under which these negative consequences may be acceptable, and the search for possible alternatives.

We are now living with the paradox that knowledge societies no longer accept unquestioningly knowledge institutions with undisputed authority. Knowledge is becoming pluralized and decentralized; it is more fragile and debatable. But this has a necessary effect on power because, following Bacon's principle, we were accustomed to the idea that knowledge strengthens power, whereas the exact

opposite is true today: knowledge weakens power, at least in the sense that power now seems to require a much wider array than what was previously considered authoritative knowledge. There has been a growing pluralization and diffusion of knowledge, de-monopolizing it and opening it to dispute. Along with the scientific research that has traditionally taken place at universities, new ways of knowing are appearing from a diverse set of social agents, such as the knowledge of NGOs, the professional skills of citizens, the knowledge of various social subsystems, the accessibility of information, the multiplication of expert knowledge, and so on. To the extent that the production of knowledge is diversified, the possibility of controlling these processes decreases. Knowledge societies are characterized by the fact that more stakeholders also wield increasingly diverse background knowledge; these informed participants are in a position to assert their own knowledge when confronting government projects. Instead of an increase in certainty, we have a multitude of cacophonous voices discussing their claims to knowledge and their definitions of non-knowledge.

Jasanoff uses the term ‘technologies of humility’ (2005: 373) to talk about an institutionalized way of thinking about the frontiers of human knowledge – that which is unknown, uncertain, ambiguous, and uncontrollable – acknowledging the limits on prediction and control. A similar approach encourages us to consider the possibility of unforeseen consequences, to make explicit the normative features that are buried within technical decisions, to recognize the need for collective learning and multiple points of view.

In this context, rather than the traditional image of a science that produces objective ‘hard’ facts, pushing back ignorance and telling politics what to do, we need a type of science that will cooperate with politics in the management of uncertainty (Ravetz, 1987: 82). For this reason, we must develop a reflexive culture of uncertainty that does not perceive non-knowledge as the outer limit of the yet-to-be investigated (Wehling, 2004: 101), but as an essential part of knowledge and science. We should not regard that which is not known, uncertain knowledge, the merely plausible, non-scientific forms of knowledge, and ignorance as imperfect phenomena but as resources (Bonss, 2003: 49). There are times when, in the absence of undisputed and unambiguous knowledge, cognitive strategies must be developed in order to take action within the bounds of uncertainty. Among the most important types of knowledge are risk assessment, management, and communication. We must learn to operate in an environment where the relationship between cause and effect is not clear, but fuzzy and chaotic.

## **Expert knowledge and political advising**

There was an intense debate in the 1960s about science and technology. One side denounced the illegitimate influence that science and technology had on politics while the other side expected the resultant end to all ideology. The technocratic

right-wing and the anti-technology left-wing concurred in their positivist conception of scientific knowledge, granting it an objectivity that would render politics unnecessary. Accompanying this discussion was the simultaneous question about the role experts should play in the political process. Meanwhile, the aforementioned modification of the concept of knowledge also had major implications for the concept of political advising. In spite of the technocratic dream, the reality is that science is but one voice in the crowd. Political, ethical, and ideological considerations also demand their place as legitimate partners in the decision-making process. Science can proffer advice, but it is not a replacement for other players.

Knowledge societies are also advising societies (Schutzeichel and Bruñsemeister, 2004). They are, in other words, societies in which the centrality of knowledge signifies that more and more areas of life require cognitive competence. People do not always possess this competence, but they can gain access to it: governments and organizations seek advice, but so do students, couples, and even souls. Contemporary societies have formed a dense advice-giving network; they demand a high degree of reflexivity about their actions since there is an increased need for information and a heightened demand for justification. Decisions must be fortified by expert knowledge, but this knowledge, to the extent that it increases the reflexivity of decisions, also emphasizes the contingent nature of decisions. Advice giving is as much the result as a cause of growing reflexivity in social life.

Politics is a field that can no longer be carried out without continuously resorting to expert knowledge. Expert knowledge is the main thing that bolsters politics when it is attempting to implement risky and controversial decisions. There is hardly any field of public administration that does not mobilize scientific knowledge in some way when it needs to inform and legitimize certain decisions. That being said, can we expect a rationalization of politics on the basis of scientific advising?

The current appeal to the need for political advising does not mean asserting an alleged objectivity to which politics must submit, in part because that conception is not supported by the enormous diversification of expert knowledge. Which expert should we obey when they are so ubiquitous and when they often hold opposing views? The pluralization of knowledge implies a weakening of its ability to command. The power of experts decreases when their number increases, and as the use of expert knowledge becomes more widespread, knowledge itself is also problematized. 'Risk societies tend to be self-critical. Their experts are relativized or are dethroned by counter-experts' (Beck, 1996: 32). The proliferation of expert knowledge, which is becoming increasingly generalized and diversified, means it is no longer the exclusive privilege of any particular state or government; instead, it is theoretically within the reach of any state or group in a civil society. Thus, in spite of the supposed technocracy of the

experts, we are seeing an overall democratization of expert knowledge.

On the other hand, the relationship between power and knowledge is much more complex than that assumed by the theory that power is subordinate to knowledge. At times, in fact, the exact opposite holds: expert knowledge is manipulated by those in power to justify previously adopted political decisions. In addition, the world of experts is not generally peaceful or uncontroversial. At times, political conflicts reproduce the disputes that are taking place in the heart of the scientific community. Science is rarely able to resolve political disputes; instead, scientific controversies frequently add fuel to political disputes. Every expert has a counter-expert, which helps deprive scientific knowledge of its alleged certainty. Scientific opinion, far from putting an end to the debate, very often serves to increase the number of perspectives and consequences that must be taken into consideration. Thus begins the game with experts on either side, making it clear to the public that, in the case of complex issues with political and social repercussions, scientific precision in no way ensures rational decisions.

In recent years, a lot of progress has been made in the democratization of expert knowledge, both in regard to the choice of experts and the production of and access to expert knowledge. The key issue is how to regulate control of the knowledge involved in the political advising process: the type of knowledge sought, the selection of advisers, the fields of knowledge they represent, their institutional affiliation, the manner in which they present their results (whether through recommendations or factual reports). The ‘democratization of expert knowledge’ does not mean adding more players to an unchanging institutional and cognitive framework. Instead and most importantly, it implies reflecting on and transforming the very framework itself, its perceptions and implicit goals, as well as its deliberative processes.

There are already many regulations in place to allow us to take advantage of expert knowledge while simultaneously preventing a true colonization of governments and parliaments by the experts’ uncontrolled influence over democratically legitimized politics. Since it is true that, among other problems, political advising may lead public actors to become dependent on private experts, it can ‘deparliamentize’ decisions or postpone them indefinitely. It can also afford politicians immunity from political criticism. To avoid these dangers, regulations have been introduced on the selection of experts and their qualifications, control, transparency, and openness. The code of practice for political advisory committees formulated by the Chief Scientific Adviser of the United Kingdom has as its primary goals openness and transparency of the process. According to the White Paper on European Governance (2001), the Commission of the European Communities has also formulated guidelines regarding the use of expert advising. One recent measure is the newly created registry of lobby groups proposed by Commissioner Kallas in 2008. The aim of these and other measures is primarily to ensure openness, plurality, and integrity

of the expert knowledge that is employed so as to safeguard quality and trustworthiness.

The larger question that this poses can be formulated as follows: What procedures and protocols of scientific advising can both ensure the quality of expert knowledge and be effective in the context of political action? In any case, the belief in a direct translatability of scientific knowledge to policy decisions has now been rejected as simplistic. The traditional conception of advising approaches the question in a top-down manner in which 'ready-to-use' results are transmitted. What both the decisionist approach (first politics, then the experts) and the technocratic model (first the experts, then political judgment) have in common is a strict separation between knowledge and decision-making (Millstone, 2005). Both view the transfer of knowledge as a linear model that suggests a temporal separation between a place where knowledge is produced and another where it is applied, as well as a clear distinction between facts (scientific) and values (political). In both the decisionist and technocratic models, the function of experts and politicians remains separate. Advising is carried out as a monologue: either science dictates solutions to politicians, or politicians determine what science must justify.

The constructivist model of political advising is quite different and has broken the links that proceed from the identification of the problem to expert advice and finally to political decision-making. In contrast, the constructivist model opts for a process of argumentation. Advising is not meant to simply transfer information that is already known; it is a moment of self-reflection for both science and politics (Gill, 1994). Political advising must be conceived, not as subordination, but as a communicative process. Jasanoff speaks of co-production between adviser and advised (Jasanoff, 2005). Advising is a process of negotiation in which experts and decision-makers discuss the suitability of available knowledge to the particular problem they are attempting to decide. Advisers do not simply present facts related to a given problem; the knowledge communicated during advisory sessions is interpreted and assessed by all parties. Similarly, when it comes to risky decisions, the judgment of the experts should also clarify risks and uncertainties. Political problems should be translated into the language of science, but the scientists' answers, in turn, are not applicable to politics until they have been expressed in the format of political decisions. There is no immediate conversion of scientific judgments into political decisions; the knowledge offered by scientists must be weighed in part by political considerations. With this recursive model, we are shifting from a 'speaking truth to power' approach to that of 'making sense together' (Hoppe, 1999), because there can be no strict separation between science and politics.

Advising would then serve to enhance the image of reality held by the political class and would strengthen its capacity for reflection. The emphasis is not on transferring knowledge from science to the political domain, but rather the

stimulation of politics through scientific knowledge (Martinsen, 2006). This holds true because the problems that need to be resolved are not clearly defined. They need framing and negotiation, which is a multilateral process between politics, science, and any other involved party (Bijker et al., 2009).

Given the current debates about the uncertainty of knowledge, these ideas could be formulated as follows: Political advising is meant to provide more political options, but politics itself must make a final decision about what particular knowledge to recognize as most appropriate and politically relevant (Schutzeichel, 2008: 16). The great challenge of political advising is to link scientific knowledge, which is produced in accordance with the scientists' criteria of relevance, with the criteria of political relevance. The knowledge of advising is distinguished from other types of knowledge by the fact that it must be simultaneously scientifically correct and politically useful and feasible.

### **The new relationship between science and politics**

The first condition for the democratization of expert knowledge and its social supervision is to clearly establish who can be considered an expert, a question that is in no way answered in advance. In politics, the distinction between layperson and expert is irrelevant from the start. It is not that there are no experts, but the abilities that distinguish them must be legitimized. If the people at the top of any particular discipline of science are the experts, that must be justified. In many cases, expert status is recognized in 'normal' citizens or laypeople (injuries, for example) or in locals who are affected by the subject at hand; they have come to be called 'uncertified experts' (Collins and Evans, 2002). We then have a kind of 'extended peer community': the circle of those who can and should assess the quality and opportuneness of scientific knowledge for the resolution of a particular problem is more extensive than the experts in the corresponding discipline.

For that reason, one of the current challenges of democracy is how to introduce non-scientific actors into the decision-making process, how to communicate openly about risk, widen the area of 'scientific citizenship' (Fischer, 2000), taking local knowledge and experience into account. Laypeople lack specialized knowledge, but they can sometimes have a broader point of view than politicians and experts because they are affected by or have direct knowledge of the particular subject matter. These non-experts can represent civilian life, be responsible for moral values, or have 'local knowledge', the 'scorned opinion' that Husserl tried to revindicate. In any case, and also for epistemological reasons, it is important for science not to discredit 'outside' inspiration or impulses as ignorance or hysteria. Particularly in the fields of research that attract great public attention, science should not waste the opportunities for reflection and justification afforded by the non-knowledge that it itself produces.

The demands for democratization and participation are an attempt to integrate the perspectives of non-experts and those who are directly affected so as to implement collective learning processes. This ‘politicization of the cognitive’ (van der Daele, 1993) attempts to resolve the democratic contradiction of a society of non-experts led by an elitist group of experts. The goal would be to treat everyone as citizens who are equally responsible for political decisions without ignoring their varying degrees of competence. The question about what knowledge and which normative criteria are relevant to many of our most important debates is less and less easily decided by scientifically determinable facticity or by referring to the professional abilities of individual experts. These are sources of social disputes and negotiation procedures. Europe already has a long tradition of participatory governance in science and technology in a tradition that has been called ‘participatory technology assessment’ (Joss and Bellucci, 2002), including the oft-mentioned Danish model of ‘consensus conferences’. Participation is important whenever decisions are being made in the midst of uncertainty and the use of experts seems insufficient.

All technical and scientific innovations contain risks that stem from non-knowledge, and the decision about whether a society wants to be exposed to those risks is a political decision that also involves normative considerations. We must explicitly consider them as political decisions and not define them as risk assessments resulting from a scientific observation of facts. This has at least two consequences: first, political decisions can and must encompass non-cognitive, non-expert knowledge and arguments, such as social usefulness, timeliness, and the strength of other alternatives. These criteria are rational, in the sense of employing the scientific method. Second, these are issues that must be considered politically and have not already been decided by the objective criteria of experts. Only very rarely are the political conclusions that emerge from expert advice incontrovertible.

This, then, gives rise to the paradox that politics needs more than ever to resort to expert knowledge, but this guarantees neither legitimacy nor consensus. Knowledge can no longer be used to convert political decisions into irrefutable certainties. At the same time, science is forced to dialogue with the economy, politics, and civil society concerning the relevance of its research priorities, their application to politics, economic costs, and the inclusion of consumers and citizens in the process of defining problems. From this point of view, not only does science provide knowledge to society, but society can respond to science as well. This new intersection of discourses and ways of thinking has led to a real blurring of boundaries between science, politics, and society (Nowotny et al., 2004). This can be summarized in the phrase ‘society speaks back to science’ (Nowotny, 2005); in this new reality, the public will not settle for simply being enlightened by science but also increasingly articulates its expectations and demands for science.

The disappointment politicians experience when they are not provided with clear and certain counsel corresponds with scientists' disappointment when their advice is not heeded. Both of these failed expectations raise the question about how to organize advice so as to satisfy the double requirement that the advice be both true and viable, meeting the demands of objectivity and legitimation.

First of all, the classic division of labor between science and politics cannot be maintained when science operates in highly politicized fields such as the environment, genetic engineering, or economic decisions. The new politics of knowledge must break from two dogmas: the strict separation between facts and values and the strict separation between science and politics (Latour, 2001). The complexity of today's world demands a stronger connection between political institutions and scientific infrastructures.

Modern democracies, especially when understood as knowledge societies, are legitimated by the conjunction of democratic representation and scientific rationality (Weingart et al., 2008: 7). The great dilemma of contemporary democracies is that decisions must be made in the light of available scientific knowledge, but they must also be democratically legitimized. In order to address this dilemma properly, one must first realize that these are two separate issues. In spite of all the expectations that scientific advice will alleviate the burden of political responsibility, science is still science, and politics, politics. Science and politics have different systemic rationalities. As Luhmann would say, science operates under the code of truth, and politics under the code of power. These distinct rationalities signify divergent expectations. We do not, for example, expect from politics the same objectivity and universality that must guide science; the criteria of compromise, feasibility, or political opportunity are all foreign to scientific activity.

Neither science nor politics continue to be what they were fifty years ago; they do not encounter the same problems, nor do they act under the same conditions. Technocratic hopes have faded away. The belief that it would be possible to translate scientific knowledge directly into political decisions has been proven naïve. Political activity takes place in societies that are defined by the media, and politics must struggle, now more than ever, for popular legitimation through the media. Any proposed political decision must appear both rational and politically acceptable. It has, therefore, become part of the politician's job to combine objective solutions with subjective interests, and for that reason, political advising cannot ignore the interests and limitations of political actors. One of the central tasks of advising must be the assessment of the acceptability and feasibility of advice. Scientific knowledge is not 'transported' to politics; politicians must simply do their job intelligently, according to the particular structures, processes, and rules of politics.

There is an initial stage when political judgment is indispensable: before even

resorting to science, politics must take the responsibility for defining the problem properly. This is especially important when we face problems for which not only do we not know the solution but we are unsure of the specifics of the problem (Fischer, 2000: 128). Democracy's deliberative space, its ability to generate not only a balance of interests but collective knowledge, plays a very important role in these cases of collective perplexity. Decision-making is also particularly political, despite all the scientific coverage one can accumulate. The moment of decision-making is recalled in Euripides' tragedy *Andromache*: 'Again, when strong winds are drifting mariners, the divided counsel of the wise does not best avail for steering, and their collective wisdom has less weight than the inferior mind of the single man who has sole authority.'

Thus, when we consider the relationship between knowledge and power, it is important to remember that neither of the two is all-powerful or all-knowing. They can each console the other for their loss of former privileges, sharing the same uncertainty in the form of theoretical perplexity, on the one hand, and the anxiety of contingent decisions, on the other. What privileges has power lost? The prerogative of not having to learn but simply command. What has knowledge lost? It has lost the certainty and proof that allowed it to dispense with any demands for legitimization; its social inaccuracies are now more visible. For this reason, the problem is not that we no longer know how to combine certain knowledge with sovereign power, but rather how to express both power and knowledge in order to compensate the weaknesses they each suffer so they can confront the increasing complexity of the world in tandem.

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