

On the Role of Academies in the Dialogue between Science and Society

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Times have changed since King Louis XIV of France is supposed to have said “l’État c’est moi”. The dialogue between Science and Society can no more be restricted to a political and social élite and must now address the whole Nation. In many countries it is observed that, during these last decades, the perception of Science by Society has been strongly modified, shifting from full confidence to distrust or even suspicion of compromising, especially about technological applications. The Academies of sciences should try to make science and scientists better understood and to look for the reasons of this kind of divorce, which leads to irrational fears. With the proliferating availability of uncontrolled scientific or pseudoscientific information on the Internet, it is necessary to look first at science education in order to explain the very nature of science, not smooth and definitive, but based on scientific doubt and on the perpetual quest for proofs and evidences. Attention should be given to communication which needs, more than the translation of the scientific jargon, intermediation in order to avoid any disappointment at a scientist’s answer not being sharp and definitive. Thanks to their independence from political, economical and sociological powers, the Academies are able to avoid any instrumentalization in restoring science to its rightful place.

In the first place I wish to thank the Indian National Science Academy for conveying this wonderful meeting celebrating its 75th anniversary. The French Academy of sciences in Paris is happy to extend its best wishes of prosperity and to express its will of new opportunities of collaboration on those many subjects which we do have to cop with.

One of those subjects is precisely the Dialogue between Science and Society that I will try to analyse as regards the Role of an Academy of sciences, with the particular case of our Academy.

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The dialogue between science and society

The Académie Royale des sciences met for the first time on the 22nd of December 1666, at the request of COLBERT, the Prime Minister of King LOUIS XIV. It originated from a group of natural philosophers who used to meet since 1635 discussing the ideas of René Descartes. It is quite clear that COLBERT had immediately seen the importance of sciences and arts to strengthen the kingdom of LOUIS XIV, whose power had reached an apogee. The Academy was given a Chart by the King LOUIS XIV in 1699 where it was clearly stated that the Academy was in charge of what might be called now “scientific watch”: being in touch with *“any scientist in Paris, in the whole kingdom or in foreign countries in order to be promptly informed of anything curious in mathematics or physics”*; reading any important book of physics or mathematics that might appear in France or outside...; reproducing *“major experiments”*.

Times have changed. Public choices are now handled by the executive and legislative powers on behalf of the Nation and understanding science should address both the people and its Representatives. This is the very issue of the dialogue between Science and Society.



Jean-Baptiste COLBERT (1619-1683)

Absence of malice, as a first step, I would just recall the words of a French Deputy, eight months ago, answering a question of a journalist about a law to be discussed concerning Bioethics: *“The government did not want the debate to be confiscated by experts”*, as a justification of the absence of scientists in the working party.

I do retain this sentence because of the two words “confiscated” and “experts”, which appear to me as representative of the distrust or even of the diffidence of a part of Society regarding science and, more specifically, its technological applications: Science being considered as the “Affair of scientists” with their hermetic jargon, their codes, their “non-said” and even some suspected compromising.

Although it is easy for scientists to put the blame on the Medias, accused of non understanding and of an exclusive interest in sensational or scandalous matters, even scientific ones, it seems more important and constructive to look for the reasons of misunderstanding or non understanding that are not only a matter of jargon.

Understanding Science

A first example of the difficulty in Understanding Science appears with the frequent impossibility for a scientist to answer such a simple question as *“What use is it?”* properly, in order to be understood. This feeds in France, the now famous distinction between “researchers” and “finders”, which is brought back whenever a debate about fundamental research occurs. And yet it is so easy to give examples of important discoveries for which the applications were not foreseen, even in the concerned scientific communities; I would take, as an example, the first successful trial of a maser (the ancestor of the laser) in 1950, which was received with the comment *“Oh! A nice solution looking for a problem”* by the physicists at Columbia University, as it is recalled by the inventor, Charles TOWNES, in his book *How the laser happened*.

Not to mention serendipity, it turns out that, unfortunately for the above mentioned distinction between “researchers” and “finders”, the most fruitful discoveries appear to have often been those for which applications could not even be anticipated: an illustration of the statement by Vannevar BUSH, quoted by President OBAMA, *“Basic scientific research is scientific capital”*.

As a matter of fact it is the very nature of science, based on scientific doubt and on the perpetual quest for proofs and evidences to comfort, assess or invalidate theories and paradigms, which should be understood. The common way science is often taught at school does not enhance this characteristic – at least in our country – but, on the contrary, tends to present progress in science as smooth and science as definitive. It follows that scientists, when asked for, will be expected to give a sharp answer valid once for all, whereas they will refer to the “present State of knowledge”. This yields the disappointment of Society: scientific doubt is therefore transformed into doubt ABOUT science, which is commonly heard through such sentences as “*On the same topic, science will say tomorrow the contrary of what it said yesterday*”. It is therefore essential that the fact that science retains and hides at the same time as it reveals and enlightens be made clear and acknowledged through education, and that Society should not understand it as an incentive to decide that scientific quest is aimless and to rely on irrational feelings, on fears, on rumours, ... that proliferate on the Web.

In an attempt to overcome this difficulty scientists have tried to ponder their answers by means of probability rates. It turns out that the interpretation of this kind of index of confidence may generate misunderstandings, shifting the probabilistic writing into a deterministic one: to make it clearer, “the probability that cause A be responsible for effect B is 90 %” being transformed in “cause A is responsible for 90 % of effect B” since it is easily understood that the second statement, the deterministic one, is much more convenient for decision making.

Uncertainty and Public choices

This leads us to the main problem of the Dialogue between Science and Society as regards public choices: *How is it possible to conciliate Responsibility and Uncertainty?*

The inclusion of the “Precaution Principle”, in February 2005, in the French Constitution as a part of the Environment Chart is an example of the way decision

makers try to address this issue and of the unexpected consequences that may come out.

It is concerned with “*the realization of damage, although dubious in the state of the scientific knowledge, [that] could affect environment in a serious and irreversible way*”. It calls for “*the adoption of temporary and proportioned measures in order to avoid the realization of the damage*” and, at the same time, for “*the implementation of procedures of evaluation of the risks*”.

An assessment of the application of this constitutional text was recently debated, which pointed out that the field of application of the principle had been *de facto* extended out of the environmental field with surprising interpretations of the concept of risk when left to the appreciation of a judge. Moreover, although it seems clear that the temporary measures to be implemented should be compatible with the research necessary to the evaluation of the risk, some decisions are in contradiction with this necessity.

Even if it does not cover all aspects of the principle, I do interpret the wording as calling for moratorium measures and rigorous independent scientific researches until it is possible to move from *Uncertainty* to *Risk*, following the distinction made by John Maynard KEYNES, where *Risk* denotes quantified uncertainty through a sufficiently assessed probability modelling of a recognized potential damage. Society is accustomed to deal with this sort of deterministic uncertainty through prevention, with due consideration of the *pros* and *contras* and of the economical and social bottom-lines of the proposed actions. Risk stimulates researches to reduce the probability of occurrence and/or the importance of the consequences of the concerned damage. Whatever its relevance, this distinction between uncertainty and risk still retains some true challenges for the decision maker when risks related to very high damage with very low probability of occurrence are under concern, which are highly dependent on the probabilistic model, or when the precaution principle is referred to for ethical uncertainties, which may not be solved by scientific investigation.

What role for the Academies of sciences?

I would now briefly sketch out how our Academy tries to contribute to a better understanding of science and scientific issues, quite often jointly with other Academies (Medicine, Agriculture, Technologies ...).

Science Education

I will first underline the importance of Science Education meaning Education TO science in addition to teaching science.

In a recent contribution to *Issues in Science and Technology*, Bruce ALBERTS insists on the necessity of a complete change in the way science is taught at school; he gives the example of a scientist parent acting as a volunteer teacher and asking the children to write down their observations after looking at three different soils with a magnifying lens: the children were unwilling to write anything because they did not know the “right answer”. I am sure many of us had kind of similar experiences, even with students of high level (at least, I did!).

Such evidences are one reason why our Academy is deeply involved in “*La Main à la Pâte*” (Hands on), an initiative by Georges CHARPAK in 1996, Nobel Laureate in Physics, dealing with science education in primary and secondary schools. It aims at helping teachers implement inquiry-based science education in the classroom through conferences, training and publications, field exchanges, internet services and networking of teachers; it also fosters the involvement of the scientific community and cross-disciplinary and collaborative projects. It stands today as a focus program for innovation in science teaching.



La Main à la Pâte

Nobody will deny the necessity of pedagogical shortcuts. “*Hands on*” teaching cannot be the general practice whatever the discipline and whatever the level. Also, teaching science strictly following the historical trial and error process would not only be uselessly time consuming but, overall, counterproductive. Nevertheless, when given in due time, the presentation of the historical path that led to some fundamental scientific concepts is not only part of the scientific culture but of culture itself in its full philosophical extent; it helps understanding the modesty and integrity of Science, and – let us have a dream – it may arouse the curiosity of the future adult for science under progress and scientists doing it.

Science education must acknowledge the integrity of science and the role of science for dismissing irrational fears; it must restore confidence in science as benefiting the progress of the humanity and therefore, at the same time, enhance the necessity of ethical considerations.

The dialogue with Society

The Academy is deeply concerned with establishing and maintaining relationships with the Representation of the Nation. Following the path opened by the Royal Society in the UK, the *Académie des sciences* has implemented a process of pairing between Members of Parliament (Deputies and Senators), Academicians and junior researchers. After three years of existence it has proved quite efficient for a better understanding of each other’s jobs, responsibilities, goals and constraints. Lasting links have been created that may be activated by either part when appropriate.

Regarding scientific and technological issues at large, the Academy has received very few commands from the President of the Republic, who is its “Protector”. The most recent one was a report prepared for the year 2000, where three strategic axes of research and development for the country were brought out, which are those retained recently in the national strategic plan for research and innovation by the Minister of research.

The ministers usually command some two or three reports a year and the Academy, on its own initiative, may prepare reports on topics it considers as potentially hot in the medium-long term. I must say that I consider this kind of reports as the very gist of the mission of the Academy. Such was the case recently with the report on *Water resources* and with the report on the *Evaluation of public researchers and professors*, anticipating the consequences of the new law organising French universities. A report was recently completed on the *Durability of numerical data* and two are under progress on the *New trends in Metallurgy*, necessary for the new energy agendas, and on sustainable development: *Feeding the world*.

One may wonder about the outcome of these reports. It is fair to say that we have to make it understood that our legitimacy and the credibility of our opinion come from the competence of the members of our working parties and from our procedures that aim at ensuring our independence from any political, economical or social influence, with no conflict of interests.

Communication with the public remains the most difficult challenge. The Academy is expected to give the reference scientific opinion on “hot” subjects even if the interest of the public is nothing but fleeting. Statements are issued, often jointly with other Academies. On environmental issues the relevant Committee of the Academy produced an e -“booklet on environment”, which was posted on the Website last year, being meant to be used either by educators or directly by the public, provided they know of its existence.

Obviously, some “hot” topics may still be debated among scientists themselves, which is not surprising since controversy has always been inherent to science as shown, for example, by the Statutes of the Academy in 1699:

“The Academy will take care exactly that, in the occasions where some academicians will be of different opinions, they do not employ any term of contempt nor of sourness one against the other, either in their speeches, or in their writings; and at the same time as they will fight the feelings of some scientists whoever, the Academy will exhort them to speak about them only with care”.

Unfortunately, when it passes to the public, we observe that the emphasis is most often put on the controversy and not on science.

As an attempt to make the dialogue easier, the Academy has just decided to open a new heading on its Website, with the first topic being devoted to sustainable development, including the variety of scientifically assessed analyses of this issue by Academicians. This initiative should not be misunderstood as some kind of renouncement by scientists, leaving it to the public to decide upon scientific controversial issues. By bringing out scientific evidences, conclusions and questions pending, and explaining progresses and validations that are expected, it should meet the rightful public demand that scientists play their true role without any dramatization by the Medias.

The role of Inter-Academy bodies

International links between Academies happen to be of great help in dealing with the above-mentioned difficulties regarding the dialogue between science and society, which obviously are not specific to one Academy. Let us consider two illustrative examples.

The first one concerns ALLEA (All European Academies), presently a very active European body, which decided at the beginning of this year to investigate the topic of evaluation. Two informal meetings already took place where the participants could share their experience and benefit from the reports already prepared by some of them. Addressing this topic at the European level is of the highest importance for public choices in each European country and at the European Union level in consideration of the development of European research programs and of the convergence process in education. Also, being endorsed by these European Academies, the conclusions are more likely to be taken in consideration by national governments. A similar process is presently going dealing with scientific integrity.

The second example is the meeting of the presidents of the Academies of sciences of the G8+ countries, in preparation of the G8+ summit. The purpose of this two-day

meeting is the production of a joint statement signed by all participating Academies on one or two topics of the agenda decided upon by the host country. Last March in Rome, one important topic was *Energy and Global Change*. The wording of the joint statement was not such an easy task: it was finally endorsed by all participating Academies by the end of May, transmitted to the government of each G8+ country and publicly released at the same time. Its major consequences were evident in the final statements of the G8 and G8+ summits in July, not to mention its internal impact in some Academies.

Concluding remarks

As a short conclusion I would quote President OBAMA who expressed his goal to “*Restore science to its rightful place*”. The true issue, as pointed out by Daniel SAREWITZ, is to define the *rightful place* and its limits, which call for the integrity and responsibility of science. Within this respect, it may be helpful to recall the memory of Jean DAUSSET, Nobel Laureate in Medicine (1980), who died last June and who had been, for nearly 20 years, the President of the M.U.R.S., the Universal Movement for Scientific Responsibility.

References

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