



Editorial

Recovering the confidence in science: The social prestige of science

*Recuperando la confianza en la ciencia:
el prestigio social de la ciencia*

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It is a historically well-established fact that science has attained an exceptionally high cultural and social prestige within Western civilization during the period going from the middle 19th to the middle 20th century . This was the consequence of two distinct factors. On the one hand, the concept of science had been used during the whole of Western civilization to express the ideal of the most perfect form of *knowledge*, endowed with truth, certainty and universality. On the other hand, the rapid growth of *natural science* – started with the ‘scientific revolution’ of the 17th century - had offered what was considered the most convincing model of what a genuine science *ought to be*. Therefore, the ‘prestige of science’ became practically identified with the prestige of the natural sciences, and this had as a consequence a downgrading of the cognitive status of what we call today “humanities” and, at the same time, the efforts of the scholars cultivating such disciplines to defend their intellectual dignity by maintaining that these too were sciences.

The prestige conquered by the natural sciences on the cognitive or *theoretical* plane was quickly accompanied by a similar prestige acquired on the *practical* plane, that is, considering what humans *can do*. Indeed the *application* of scientific knowledge produced the impressive growth of modern *technology* that was easily interpreted as putting science ‘at the service of man’. Advancements in medicine, in the production of goods and commodities, in transportation and communication, and a great display of artifacts that apparently made human life more comfortable and pleasant supported that optimistic appreciation of applied science and encour-

aged that identification of *progress* with the growth of science which was typical of the *positivistic* conception of society and civilization. Of course, examples of dangers and risks related with the growth of technology were not ignored (in particular the negative social consequences of the ‘industrial revolution’) but they were considered cases of *bad use* of something that is *good* in itself. Even the military application of technology was not seen as something bad, since war appeared as a sad but inevitable feature of human history, and the improvement of weapons has always been a major tool for being the winner: the use of the most advanced technology in the military domain was simply the natural continuation of such a trend. Only the terrible experiences of the two world wars of the first half of the 20th century, with many millions of dead among the civilians and numberless sufferings and destructions pushed people to consider modern technological war under a different light. We shall come back to that change of perspective later on, but we can already note that it initially amounted simply to recognizing in war a ‘bad use’ of science and technology which are ‘in themselves’ good.

There was a tacit presupposition in the background of that positive appreciation of science and technology, that is, that scientists do their job *conscientiously*, in the sense of sticking to the ‘scientific method’, by doing experiments accurately, submitting hypotheses to strict tests and controls, accepting criticism and free discussion and so on. Therefore, mistakes can certainly occur, but they are uncovered and corrected by the scientific community, so that the result of scientific research, considered globally, is a sound and self-correcting knowledge, i.e., a knowledge that, though not being *complete*, is *reliable* and, in any case, is the *best available knowledge*. This justified a full *confidence* in science: according to positivists, because science – by including both the theoretical and the practical ‘reason’ – encompasses in itself the whole of rationality (this position is called *scientism*). According to other philosophical schools, rationality adopts different forms in domains different from science, but they did not dismiss the confidence in science, that can be considered a typical mark of modern civilization.

This confidence relied upon several ‘virtues’ attributed to science. Some of them can be called *epistemic*, and undoubtedly contributed to an improvement of the intellectual standard of Western civilization: we can mention as examples the priority given to the search for *truth* regarding those aspects of reality that a given science investigates, a research based on *rational* methods that can secure *objectivity* and *rigor*. This means that in a scientific discipline one must “give the reasons” for what one affirms, and these consist in the use of standardized operational methods for testing the affirmations and referring to reality. This makes precise the notion of

data, and rigorous *logical inferences* are used in proposing explanations of the data and making predictions. These virtues actually concern scientific *knowledge* and could be better called its *qualitites*. There are, however, other virtues that can be considered typical of scientific *practice* and are, therefore, considered typical of the conduct of scientists. They are, for instance, admission of being mistaken, self-discipline, spirit of sacrifice, tenacity, openness to criticism, recognition of others' merits, humility in the consideration of the limits of one's own knowledge, spirit of cooperation. Science, in addition, adopts a *public* discourse, where right to speak is credited to whoever has acquired the necessary disciplinary competence, independently of any sectarian affiliation and, for this reason, the practice of science is a model of good *democracy*, that is, a democracy in which the truth is not established by voting, but neither can be imposed by an authority, and rather requires a patient and honest comparison of reasons and shared criteria. In this case one can see that such 'virtues' have a genuine ethical connotation and this seemed sufficient for being confident that science, if left to itself without the interference of external powers or authorities, was able to do also a morally unobjectionable work.

The crisis of confidence in science

The crisis of this confidence began towards the middle of the 20th century on the *practical side*. The explosion of the first atomic bomb with its terrific effects of death and destruction, and the perspective that this might occur again in a future atomic war, led to a change in the conception of the international politics, based on the "equilibrium of *terror*" between the two antagonist "blocks". But even the 'pacific' use of atomic energy quickly aroused *fear* of great catastrophes after the occurrence of accidents in the atomic plants of which Chernobyl was the emblematic but not unique case, while other catastrophes like those of Seveso and Bhopal showed that even traditional technologies (like those of chemistry) could be very dangerous. Finally the widespread contamination of waters, of air and environment produced by the industrial development began to introduce the idea that the growth of science, instead of being beneficial to people, was producing a considerable deterioration of the life conditions and, in the long run, could even jeopardize the survival of humankind. It is obvious that feelings of terror and fear are the opposite of confidence, and they could easily open the way to an attitude of real *hostility* against science and technology, that was actually advocated by many authors in the following decades by emphasizing the dangers of scientific progress and depicting a catastrophic outcome of its run. *Anti-science* has become in such a way a not negligible intellectual competitor of scientism in the cultural panorama of our time.

Shortly after the crisis of confidence on the practical plane, science began to lose its absolute prestige also on the *theoretical* plane. This was due to the growth of certain *epistemologies* that are sometimes called “post-empiricist” but could be better considered an overcoming of the model of science promoted by logical empiricism and developed within analytic philosophy. The main lines of that reaction are well known: developments of the Popperian falsificationism and fallibilism, the Kuhnian sociological interpretation of scientific change, the more radical sociologist interpretation of science as a social product. The most radical output of these epistemologies was the denial that the aim of science is the knowledge of truth about reality, that respect for data and logical consistency are the fundamental criteria for assessing the value of scientific theories, that rival theories can be objectively compared, that it is really possible to speak of progress in science, and even that it is possible to distinguish science from pseudo-science, since what is credited with being scientifically valid wholly depends on the socio-cultural context. This ‘demythization’ of science actually amounted to downgrading its epistemological profile and, therefore, to discredit it as a particularly solid form of knowledge, independently of other perplexities of practical nature that, as we have seen, had primed the crisis of confidence in science. In such a way a transition began from the absolutization of science, believed to be able to cope with all the human problems (scientism), to a not less one-sided mistrust (anti-science). Precisely in this straddle lies one of the deepest reasons for the uneasiness that affects our present culture, an uneasiness from which it is necessary to get out because we must recognize that there are *many good reasons* for trusting in techno-science, but at the same time the criticisms that have been addressed to the way in which activities in the domain of techno-science are performed *are not groundless*.

Research integrity

A first indispensable step consists in establishing conditions whose fulfillment can make us confident that the published result of a research has been assessed by experts according to those requirements of objectivity and rigor that, as we have seen, characterize scientific knowledge. This constitutes what we could call the epistemological side of *research integrity*. In short, we want to be sure that a published scientific paper contains really ascertained data, without manipulations, omissions, plagiarism, distorted arguments, so that experts in the field can confidently proceed to assess its specific ‘scientific value’. From this point of view we are requiring a fully correct conduct from the side of the author(s) of the research, whose faults can go from simple inaccuracy to real misconduct. It is perhaps a little forced to qualify

as ‘ethical’ such a commitment since it simply amounts to respecting the ‘constitutive rules’ of scientific practice, that is, the rules not following which one ‘does not do science’. The issue of research integrity, however, also includes not strictly epistemological aspects, such as, for instance, the accurate and honest conduct of the referees, the policy of the scientific journals, and several other aspects like those related with the dependence of research from public and private funding, the complex links with industry and economic powers, the role of the institutional structures according to which research is organized, the control over the channels for the diffusion of the results. To sum up, the thematic of research integrity concerns a series of warranties that are essential in order that science recovers that confidence of society and public opinion that has been damaged in part also because of the publicity that has been given to isolated, but real, cases of misconduct by scientists. This has certainly contributed to the diffusion of anti-scientific attitudes in several layers of the population which manifest themselves, in particular, in the fact that many people today have recourse to a lot of scientifically discredited practices.

Beyond research integrity

Research integrity does not cover the whole domain of the *research ethics* because it does not overstep the horizon of techno-science itself. One could say that it is a program for putting order and cleanness ‘at home’, also with the view of giving back to the building its dignity and prestige, but it does not thematically consider the problem of putting the whole techno-scientific system in relation with other systems that interact with it within the more complex social system and even with the entire global system.

We are touching here upon an important point of the crisis of Modernity: it has discovered and celebrated several *autonomies*, but these have gradually transformed themselves into autarchies and often into hegemonies, and this has inevitably led to incompatibilities and conflicts. Today we are aware that it is necessary to find again a unity, that can no longer be proposed in the form of a hierarchic order on the top of which could be put science, rather than religion, nation, a political ideology, economics or ethics itself. More viable seems the search for a unity of a systemic kind, in which every subsystem is respected in its internal autonomy but at the same time provides answers and receives support from the other systems, modulating its own functioning in agreement with these different inputs and outputs. In particular, different ‘voices’ find expression in the system of the ethical norms that are present in our ‘plural’ societies (depending in part on broader religious or ideological concep-

tions regarding the sense of existence), and it is natural that, within the research activity performed by the different persons, these voices legitimately want to be listened to. An ethics of research cannot ignore this problem and must elaborate those practices of listening and discussion, of mutual understanding and dialogic mentality that are indispensable when we have to do with the delicate sphere of moral conscience. Indeed, research as such deserves a full respect from us and society, but the conscience of the researchers deserves an even greater respect. Such a perspective on ethics is not easy to promote because it requires at least a preliminary condition, i.e., that science (that is, concretely, scientists) does not pretend to have the monopoly of knowledge, and sincerely admits that there are different forms of knowledge that cannot be inscribed in it. It is out of doubt that science enjoys a privileged condition (that of being intersubjective) but this depends on the specialized and limited scope of any disciplinary outlook: the more a discourse is specialized, the more it becomes precise and testable. But in such a way not only the single sciences, but science as a whole does not have at its disposal the tools and methods necessary for facing those problems of great purport that concern the general interpretation of reality, the possibility or impossibility of reducing it to the pure dimension accessible through the senses, the sphere of duty and morality, the possibility of conferring to existence a sense. Calling these “pseudo-problems” – as logical empiricists once used to say – is a poor linguistic way out that by no means can eliminate them, and regarding them humans have engaged during many centuries in deep discourses, subtle analysis, rigorous arguments (besides expressing them in implicit forms through the languages of arts and literature). For a serious approach to the ethics of scientific research it is necessary to develop a dialogue with such forms of knowledge.

Relevance to bioethics

At first impression the issue of research ethics does not concern directly bioethics since this has to do with decisions to be taken in concrete situations in order to attain a balance among several competing rights, duties, interests, legal norms, economic reasons, and so on. Nevertheless we cannot overlook the fundamental fact that these decisions must be taken in situations produced by the advancements of science and technology and, therefore, a fundamental prerequisite is confidence in science. Without this confidence, even such obvious criteria as a comparison between risks and benefits, the serious attainment of an informed consent, the choice of the ‘optimal’ solution, the trust in the doctors and the medical diagnoses and therapies are seriously jeopardized. This is why ethical codes concerning scientific research are

being approved today in many countries and applied in several institutions. One must note, however, that it is not through a detailed description of cases and procedures, and a detailed list of norms and sub-norms that we can hope to solve the problem of research integrity and research ethics, but rather through the promotion of a generalized ethical sensitivity and the sense of duty in our societies. This is a problem that concerns primarily education, but education, in turn, cannot promote an ethical standard that is not supported by an adequate ethical standard of the society where this education is proposed, so that, finally, everyone is responsible for the promotion of this maturation of the public moral conscience.