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Making marketing difficult

Abstract: A critique of conventional science journalism is offered in this paper. The convention of science journalism as science transmission is claimed to be incapable of coping with challenges emerging from the present commercialization of science — letting science into society by embracing and being embraced by the market-place, while maintaining the old scientific alienation from political life. The case is made that modern science was born ambiguous towards the market-place, and that such ambivalence — relating to different interpretations of the idea of knowledge as a common good — is still to be encountered among scientists. Drawing on series of interviews with scientists from bioscience and biotechnology it is argued that, on the one hand, scientists are into marketing and PR exercises; but, on the other hand, they also voice a demand that journalists should make such marketing difficult. It is the conclusion of the paper that journalists must break with the convention of science transmission in order to fulfil that demand, and in order to spur a political discussion, among scientists and in public, on how to maintain the idea of knowledge as a common good.

During the past decades, swarms of scientists from a wide range of fields have migrated from their ivory towers and descended onto the market-place, adapting themselves to marketing practices in the process. With surprising ease, science journalism seems to be adapting too; penduling comfortably between old-fashioned enlightenment, aimed at promoting science as a common good, and PR exercises, aimed at selling science on behalf of private interests. This development provides food for thought in more than one sense.

In one respect, it prompts a critical question regarding conventional science journalism, marked by a lack of distinction *vis-à-vis* science popularization: does this kind of science writing in fact differ significantly from marketing practices? At first glance at least, there does not appear to be a big difference — if any at all — between promoting and selling. Moreover, it prompts reflection on what kind of practices journalists, who are committed to enlightenment ideals about the rule of reason — ambiguous as those ideals are — should pursue in modern societies in order to keep the ideals alive. Should they stick to conventions and simply continue to promote or to sell science? Or should they acknowledge that to promote what is seen, naïvely perhaps, but nevertheless, as a common good, is a far cry from selling the same thing, in much the same way, on behalf of vested interests? The latter question constitutes the argument of the present paper.

The convention of science transmission

The fundamental convention of science journalism is the convention of science transmission. That is, the *prescription* that journalists should relate to science by way of transporting scientific facts from scientists to a lay public for consumption¹. The convention also contains the *proscription* that journalists should not interfere in any way with the scientific facts. They should not concern themselves with questions of knowledge. Reflection on such questions should be strictly confined within the scientific community.

From this description, it is fairly easy to spot what is *similar* to the convention and marketing: neither allow for sceptical and critical questions to be posed.

But how did the convention come about? Is there a link, also in its *origins*, to the market-place?

The convention may be seen as an annex to an old, unwritten contract between science and society. That is, the at the same time paradoxical and pragmatic agreement that science was a valuable part of society by *not* being part of society. Science was agreed to be, somehow, situated

¹ For a brief discussion of science journalism, based on the convention, see Friedman *et al.*, introduction.

outside society. Residing in a remote spot, supposed to be above moral disagreement and conflicts of interest, science was expected to produce 'pure' knowledge, and knowledge could be celebrated as a common good — for everybody to rely upon — exactly because it was understood to be disconnected from society. Lines of information had, however, to be established in order for the rest of society to share in the pure light of science. Scientific results, thus, had to be transmitted, by scientists themselves, or by journalists.

In the early eighteenth century science was — so writes the British historian Roy Porter — "energetically promoted amongst the public. Initially in London's coffee houses, lecturers began to offer demonstrations with globes, orreries and other instruments displaying the marvels of the clockwork universe, while performing chemical, magnetic, electrical and airpump experiments besides. In the spring of 1713, for instance, Newton's protégé William Whiston was holding forth on mathematics and science at both Douglas's coffee house in St. Martin's Lane and at the Marine coffee house near the Royal Exchange..."² And in the journal *The Spectator*, Joseph Addison and Richard Steele in 1711 foresaw with delight those times "when Knowledge, instead of being bound up in Books, and kept in Libraries and retirement, is thus obtruded upon the Publick; when it is canvassed in every Assembly, and exposed upon every Table."³

The convention and the practice of science transmission has, in other words, quite a long history. Transmission has been motivated by aims of 'pure' enlightenment and of spreading the gospel of the scientific worldview, but probably it has always been a mixed-purpose-enterprise. To a varying degree it has also been motivated by aims of promoting and providing support for individual scientists, or, for that matter, by straightforward marketing aims — mirroring the fact that the attitude of science towards the market-place always was one of ambivalence.

Science and the market-place

In the 1940s Robert K. Merton, the American sociologist, described the values of science in this way: "Four sets of institutional imperatives — universalism, communism, disinterestedness, organized scepticism — comprise the ethos of modern science."⁴ By 'communism' he meant that scientific knowledge was regarded as common property. He remarked that "[t]he scientist's claim to 'his' intellectual 'property' is limited to that of recognition and esteem", and he developed the point further by stating that "[t]he institutional conception of science as part of the public domain is linked with the imperative for communication of findings. Secrecy is the antithesis of this norm; full and open communication its enactment." Merton also made frequent comments on the issue of patenting, for instance in the following way: "The communism of the scientific ethos is incompatible with the definition of technology as 'private property' in a capitalistic economy. Current writings [1942 - gm] on the 'frustration of science' reflect this conflict. Patents proclaim exclusive rights of use and, often, nonuse."⁵

Thus, clashes between ideals about knowledge as a common good on the one hand and knowledge as an instrument and as the private property of vested interests on the other hand is not a new phenomenon. The case can, indeed, be made that modern science was born with a schism of being connected to and alienated from the market-place at the same time. H. Butterfield, the British science historian, refers to the end of the seventeenth century when stating: "The passion to extend the scientific method to every branch of thought was at least equalled by the passion to make science serve the cause of industry and agriculture, and it was accompanied by a sort of technological fervour. Francis Bacon had always laid stress on the immense utilitarian possibilities

² Roy Porter; p. 142

³ Roy Porter; p. 194

⁴ Merton; p. 607

⁵ Merton; p. 610-612

of science, the advantages beyond all dreams that would come from the control of nature: and it is difficult, even in the early history of the Royal Society, to separate the interest shown in the cause of pure scientific truth from the curiosity in respect of useful inventions on the one part, or the inclination to dabble in fables and freakishness on the other."⁶

A tentative conclusion from this brief discussion would be that ambiguity towards marketing is inherent to the convention of science transmission in the same way as ambiguity towards the market-place is inherent to science.⁷ The convention is a product of ideals about knowledge as a common good, but it encompasses, at the same time, the complicated relationship between science and private interests in the market-place. It was, so to speak, born and bred with frustrations regarding the issue of public and private interests in relation to knowledge.

Science and politics

The attitude of science towards another aspect of society, that of politics, does not display a similar kind of mixed feelings. Actually, the term 'unalloyed distaste' is more to the point.

Turning to history again, the British Royal Society provides an illustrative example. The society presented itself to the world in the 1660s with a solemn promise that it would not "meddle with politicks, rhetoric, divinity".⁸ Modern (natural) science, as it was presented here, was eager to distance itself from societal life. Civil wars and religious persecution had left their mark by demonstrating how conflict-ridden it could be. Thomas Sprat (1635-1713), one of the founders and the first historian of the society, has left this remark on the early members: "Their first purpose was no more then only the satisfaction of breathing a freer air, and of conversing in quiet one with another, without being ingag'd in the passions, and madness of that dismal Age."⁹

The early representatives of (natural) science appears to have been longing for peace in all senses of the word. Fear of confrontation and, accordingly, a striving for consensus, unambiguity and certainty are key words regarding those aspects of modern science that are related to the practical, political life of society. By distancing themselves from politics, the founding fathers of modern science tried to distance themselves from disagreement and from uncontrollability. Thus, the early formalization of modern science in the midst of the seventeenth century provided science with the role of an observer; a spectator who actively expressed distaste for participation in politics in the widest sense of the word. This striving to create a calm and peaceful space outside public and political life — seen to be dominated by power struggles and by inevitable conflicts regarding morality — has lived on ever since in the widespread idea of a dichotomy between science (representing reason) and politics (representing irrationality).¹⁰

Theodore Porter, the American historian, has convincingly made the case that the rise of the scientific ideal of objectivity should be seen as resulting from a societal climate of suspicion towards élites that has marked modern societies, and that has been strong, in particular, in the USA¹¹. Mistrust and suspicion linked to politics, are features that also catch the eye of another American historian, Gordon Wood, when he looks back to the end of the 18th century: "People

⁶ Butterfield; p. 185

⁷ I am not aware of the existence of in-depth studies of the history of science communication, from the perspective of the present paper, that might substantiate or weaken the claim. I would be grateful to be informed about such studies.

⁸ Nowotny, Scott & Gibbons; p. 63

⁹ Shapin & Schaffer; p. 76

¹⁰ The present paper is based on the assumption that although a distinction should, indeed, be made between science and politics, the idea of a dichotomy between the two is not only unwarranted, but also detrimental to science as well as to politics: it produces unreasonable politics, and it deprives science of the capacity to cope with its own political aspects by blinding scientists to those aspects.

¹¹ Theodore Porter refers to "the American political context of systematic distrust" (p. 149) and he discusses calculation — while referring to "the corruption of politics" — as "one scheme for neutralizing politics". (pp. 122-123)

increasingly felt so disconnected from one another and so self-conscious of their distinct interests that they could not trust anyone different or far removed from themselves to speak for them in government. American localist democracy grew out of this pervasive mistrust."¹²

In short, science appears to a considerable extent to have been shaped and celebrated as a common — a public — good by being understood to represent *the opposite* of a political life of mere irrationality and the power play of private interests. Likewise, the convention of science transmission appears to a considerable extent to have been developed as the active antidote to politics; a means of transporting reason to a public sphere, understood to be fundamentally invalid in that respect.

That idea of politics is still with us. At the close of the twentieth century the American, political philosopher Stephen Macedo points to "the interest group model" as the dominating idea of democracy, marking mainstream political science and forming the basis of mistrust of politics. The model conceives of democracy as a struggle where different groups cynically strive to serve their own, narrow interests at the expense of the interests — equally narrow — of other groups.¹³

The halfway socialization of science

The idea of science as a common and public good is still strong, not only as a rhetorical device, but also as an ideal worth striving for. In practice, however, there are signs of decline; the old contract between science and society is rapidly falling apart.

The assumption about science being situated somewhere outside society has proven to be too much of an illusion. Science is present almost everywhere in society; and society is present almost everywhere in science. There are scientific elements to a growing part of public affairs. As a rule, it is possible to find scientific specialists or scientific studies to match any issue that is up for public debate. Some certified 'knower' or knowledge may be called upon to comment on — or even to settle — complex issues that are neither purely political or purely scientific. This is the case regarding environmental issues, social welfare issues, health issues, educational issues, etc. Last, but certainly not least, industry and commerce depend heavily on science; and science funding depends heavily on commercial interests. Thus, in the last decades it has become almost commonplace that the old contract is breaking down¹⁴. The claim that science is a social phenomenon and is part of society is today of very little controversial value.

There are, however, few signs of a new contract being established, nor of assumptions and ideals about science, politics and the market-place being rethought.

In practice, scientific ambivalence towards the market-place seems to be vanishing or, rather, perhaps, to be muted. Science has re-entered society by embracing and being embraced by the market-place. At the same time, the alienation of science from politics persists. The political philosophy of science has been one of avoiding politics as the epitome of irrationality. Thus, it has not been one of deliberating on how to contribute to politics as the pursuance of reasonable discussion and action in a public sphere, conditioned by basic uncontrollability, ambiguity and disagreement.¹⁵ Today, those very conditions of public reason still appear to be widely regarded as contrary, not only to scientific reason, but to any reason at all.

In short, one may speak of a halfway socialization of science, returning to society by strengthening the connections to the market-place, but apparently without embarking on reflection about reconciliation with public and political life, where reasonable discussion and action must be pursued on those very conditions that science has been developed to avoid. Likewise, there are few

¹² Wood; p. 245

¹³ Macedo; pp. 112-116

¹⁴ Gibbons

¹⁵ My discussion of politics has been inspired by Hannah Arendt. See Arendt; pp. 22-79.

signs of the journalistic task towards science being fundamentally updated. Routines and taboos connected to the convention of science transmission persist, and it does not seem to make a world of a difference that, at present, such routines are likely, more often than not, to serve purposes of selling — or, indeed, overselling — on behalf of vested interests.

The adoption by scientists of commercial sales techniques is a widespread phenomenon. Recently, this has been commented on by an international group of researchers from the field of science studies, stating: "Today insubstantial promises, which are based upon a potential that is difficult to assess properly and which will take time to develop fully but which are amplified through the media, excite the imagination of industry and the public and influence decisions about which parts of basic research are to be funded and which lines of inquiry are to be pursued." The group refers to "a thin line between authentic belief in the future potential and mere rhetoric of 'selling' a particular line of research to politicians and the public", and they argue that "[t]he frequency with which researchers adopt 'sales' techniques in their attempt to obtain funding for what, in fact, are mere 'options', possible 'futures' fallouts or spin-offs of unknowable research results, is increasing."¹⁶

What may, in the long term, be the consequences of PR exercises of the above kind? To what extent is it possible to get away with using ideals about knowledge as a common good in order to sell on behalf of vested interests? For how long is the public at large, against this background, likely to continue to trust that scientists are pursuing knowledge as a common good?

Three decades ago, Jerome Ravetz (switching from physics to studying the social problems of scientific knowledge) expressed concern — while referring to "the conditions of the industrialized science of the present"¹⁷ — about moral corruption of science. He feared that science might degenerate, and he worded a nightmarish vision of future science as "gigantic confidence-games, producing pseudo-property at a feverish pace, and resembling a stock exchange in a bull market rather than a collective endeavour on behalf of the highest human goals."¹⁸ Ravetz expressed his concern in unusually powerful wording, but in substance it may not be that unusual. There is uneasiness among today's scientists about the current commercialization of science, and about how science may be affected by the harsh competition for funding. There is uneasiness about having to cope with vested interests and with self-interest.

Uneasy scientists

A recent research project on journalism's relations to science included a series of eight qualitative research interviews with Danish scientists from university research in the field of biomedicine. The scientists were questioned about commercialization and about 'science marketing'.¹⁹ One of the scientists responded to the question of whether she thought her research would be interesting to journalists, by stating: "It is a bit tricky. A private company is involved, and parts of the research are confidential, so I am not able to tell much about it." Asked what she thought about that situation, she responded: "I think it is odd. But I am not allowed to tell about the research if they consider to take out a patent."

On the one hand there is direct pressure on scientists to accept that scientific information be kept confidential and, thus, to let commercial purposes overrule the scientific ideal of openness. .In

¹⁶ Nowotny et al; p. 38

¹⁷ Ravetz; p. 310

¹⁸ Ravetz; p. 311

¹⁹ The series of interviews with scientists from the field of biomedicine formed part of my Ph.D. dissertation (2004) on journalism and science. The interviews were conducted, written, and checked by the sources (intersubjective validation) in Danish. Occasioned by the present paper the quotations have been translated into English. The dissertation only exists in Danish, but an abridged version — *Public reason? Science, journalism and society* — has been translated into English and may be obtained from the author.

some cases that pressure causes bewilderment. On the other hand, the competition for funding provides a *de facto* pressure on scientists to attempt to attract attention as problem-solvers, and as suitable recipients of funding. The interviewees were outspoken in particular about this latter aspect.

A broad question about the relationship between science and politics prompted the following response from one of the scientists: "It is all about procuring the freedom to do the things one wants to do. It could be cloning, for instance. It is also about securing research funding; whether there will be more or less public money for funding ... You must attract attention, especially if you need it because you have too little money, or if the conditions for doing research are just too ridiculous, and it is hard to find money for reagents, for laboratory assistance and so on."

The aspects of linking science to vested interests and of being directed by self-interest are interrelated in various ways, as pointed to in this statement by another interviewee: "And at the regional, local and the central levels there is political pressure that we should cooperate with companies. It has almost become a 'must' that we shall dance with industry, and the effect of acquiring a contract of around one million kroner [approx. \$200.000 - gm] is much bigger than that particular sum of money. A contract of that kind is taken to prove that you are innovative and attractive. To a dean, this kind of thing is a real treat — a group of researchers that industry finds interesting. It enables the dean to argue his case to politicians: 'You should support this fundamental research, because in the end it is likely to turn out being useful.' Thus, we are enabled to argue that there should be more public money for basic research, because our knowledge and our capabilities are regarded as useful outside the university."

Yet another interviewee argued at length that it is crucial to science to attract attention, summing up that "[a]ttention increases the possibilities of having research funded, and it is sorely needed. We cannot do anything without it, because we have no money." He also stated that "it pays to be visible, but you must be visible to the right persons; to those who are actually in possession of money. Today, that is a precondition for doing research. People use different styles when pursuing visibility — sometimes the attempts to raise money are amazingly well timed. You read an article about a research project of an acquaintance of yours, and you realize, after having read the first two columns: they are into fund-raising."

Cynicism? Yes and no. The latter interviewee was asked whether he found that journalists responded properly to such attempts. He answered: "No. I think that the quality of journalists is too poor. They are too uncritical. They are presented with some news, and they do no more than carry it on."

The interviewee who talked about political pressure on scientists to dance with industry, also discussed — inspired by an actual example — the possibility of attracting attention by going public with unsubstantiated claims, like claiming to be close to a cure for flu. "You can do a media show on that one, if you like", he said. Asked whether that would be possible without meeting any journalistic resistance, he responded: "I don't think the journalists would be a problem. They are always interested in a good story about a new cure or a new disease. This is mostly negative, I think."

Among the interviewees, the dissatisfaction with journalists who are seen to be uncritical towards the attempts of scientists to attract attention appears, in fact, to be as significant as do declarations about the necessity of attracting attention as a scientist. Still another interviewee expressed his criticism in this way: "I don't think journalists are sufficiently critical. They allow themselves to be used, and they don't ask critical questions." He elaborated on this by stating that "journalists are much more friendly towards scientists than they are towards other sorts of people". Referring to the example of the cure for flu — which had irritated more than one of the interviewees

— he added: "And apparently no journalists have asked: who is likely to gain from this, who will make a profit? I would have been disappointed myself, if I had not been questioned closely." In the first place, the interviewees from biomedicine described the relationship between journalism and science according to the convention of science transmission, as did other groups of interviewees — researchers from economics, journalists from broadsheets, and members of parliament.²⁰

Presented with the topics of commercialization and marketing, however, the scientists tended to ascribe journalists a task of complicating, rather than facilitating, scientific PR exercises: they are into marketing, but they also want marketing to be made difficult.

Silent disagreement

At a closer look, thus, the old ambivalence towards the market-place is still to be encountered among scientists. A recent, journalistic interview with Lars Bolund, a professor of human genetics at the University of Aarhus, Denmark, provides another example: "All that about branding and making money — it is far from my idea of the world of science", he said, adding: "Many researchers from the field of biotechnology do actually not belong to the world of science that I belong to. They are employed by purely commercial companies, and it makes very little sense to have them participate in scientific conferences, because they cannot be open about the really important aspects of their research — those aspects must be kept confidential. Thus, their contributions to conferences easily end up as a kind of advertisement. Because of that, I have actually experienced that such scientists have been excluded from scientific conferences, and it seems to be the trend now that they do not attend the meetings because they are unable to contribute in an open way to the exchange of ideas and experience that constitutes the very purpose of the meetings. It is a worrying development."

From the perspective of this scientist, thus, the present world of bioscience and biotechnology is not one, but two worlds; and these two worlds differ in respect to their relationship to society at large. Seen from without, however, no such difference discloses itself to the eye; the world of bioscience appears to be one. It may be that the conflicting views are subjected to discussion among scientists, but if so — the discussions appear to be undertaken in such quietness that outsiders are hardly able to hear anything but silence. According to the assessment of Lars Bolund, most bioscientists regard the commercialization of science as a *fait accompli*.²¹ They do not see public discussion on the accompanying challenges to science and society as an actual option.

Findings from another series (still in progress) of qualitative research interviews — with European bioscientists from a variety of biotech specialities — support the above claim, that the commercialization of science causes scientists to feel trapped, uneasy and bewildered.

There is a tendency to resort to an article of faith, described by Merton more than half a century ago. He observed "a tendency for scientists to assume that the social effects of science must be beneficial in the long run. This article of faith performs the function of providing a rationale for scientific research"²². The assumption that the social effects of science must be beneficial in the long run, interprets the idea of knowledge as a common good in terms of technological solutions, or, if you like, in terms of 'progress', and may not necessarily be contrary to the interpretation that links the idea of knowledge as a common good to 'openness'. At present, however, there is a tendency among scientists to understand these two interpretations to be contrary to one another,

²⁰ The Ph.D. project mentioned in note 19 also included series of interviews with university researchers from the field of economics, with journalists from Danish, nation-wide broadsheet newspapers and with members of the Danish Parliament.

²¹ The interview was conducted, written and published in Danish. Occasioned by the present paper I have translated the quotation into English. Meyer; p. 38

²² Merton; p. 600

and the former is widely used to overrule the latter. Thus, arguments about 'progress' are used to overrule arguments about 'openness'.

To some degree, it probably serves to reconcile scientists with demands about confidentiality that are contrary to their conviction. But commercialization causes uneasiness, nevertheless. One of the interviewees expressed it strongly by stating: "You would be tarred and feathered if you attempted to apply a critical approach. You would be certain, then, not to obtain any research funding again. It is harmful to the public debate. It is just like it was in the former East Germany."

It is fairly obvious that there must be disagreement among scientists on these issues. It would have had some effect, had scientists unanimously agreed that science should not simply fuse with private interests, and that some kind of distance from the market-place should be maintained. It can be seen as a journalistic task — complementing a task of making marketing difficult on a case-by-case basis — to let the disagreement out into the open, and to prompt the scientific community into having an open discussion on its own values and ideals as compared to actual practices. Welcomed by some, and strongly disapproved of by others, such journalistic endeavours — currently hampered by widespread journalistic subservience towards science²³ — would be likely to spur internal as well as public and political discussions on how to cope with the present predicament of science.

Breaking with the convention of science transmission

In order to do so, journalists will have to move on from the convention of science transmission prescribing that science should be *transported* as the epitome of reason, to modes of enquiry that facilitate reasonable, public *discussion* on questions of knowledge. The convention has become an obstacle to the integration of science into society at large.

Historically, journalists have been expected to investigate and expose disorder and infringements of rules and norms, but the convention effectively impedes such journalistic endeavours in relation to science. It obstructs attempts to raise, throw light upon and inspire a discussion on urgent issues — including breaches of the old science/society contract — regarding the role of science in today's society. In order to be able to subject breaches of contract to journalistic enquiry, journalists have, paradoxically, no other option than to break with the convention of science transmission that has been closely linked to the very same contract. The same is true as regards aims of facilitating deliberation on how to rethink the contract between science and society on the condition that science is part of — not disconnected from — society at large. Journalism deals with public affairs, opening them to public deliberation. In today's modern societies, questions of knowledge are crucial to public affairs. Consequently, they have also become public affairs in their own right. Not only scientific facts, but also assumptions and values underlying the investigations that resulted in those facts, as well as interpretations and uncertainties relating to them, are relevant to public deliberation. So are economic and other social interests that may have influenced research projects in various ways. And so are the mores and the working conditions of scientists. In order to maintain the idea of knowledge as a common good, science must be subjected to common — public — scrutiny and reflection; scientists must be included — as citizens — in a political discussion on science and society; and journalism in relation to science must be clearly demarcated from marketing.

²³ A series of ten interviews with Danish broadsheet journalists, conducted as part of my Ph.D.-project on journalism and science, indicates a marked reluctance among journalists as regards asking critical questions about science. Many journalists seem to regard science as a means of asking critical questions about *other* topics, and they do not feel entitled, competent — nor tempted — to meddle critically with questions of knowledge.

References

- Arendt, Hannah: *The Human Condition*. Chicago & London: The University of Chicago Press, 1969 [1958].
- Butterfield, H: *The Origins of Modern Science. 1300-1800*. London: G.Bell and Sons Ltd.,1965 [1957].
- Friedman, Sharon M., Dunwoody, Sharon & Rogers, Carol L. (eds.): *Scientists and Journalists. Reporting Science as News*. New York & London: The Free Press, 1986.
- Gibbons, M: Science's new social contract with society. *Nature*, 402 (supp): C81-C84. 2001.
- Macedo, Stephen: *Liberal Virtues. Citizenship, Virtue, and Community in Liberal Constitutionalism..* Oxford: Clarendon Press, 1990.
- Merton, R.K: *Social Theory and Social Structure*. New York: The Free Press, 1968.
- Meyer, Gitte: *Ekspert og samfund. En interviewbog om offentlig diskussion og videnskab*. København: Forlaget Samfundslitteratur, 2004 [in Danish].
- Nowotny, H., Scott, P. & Gibbons, M: *Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty*. Cambridge UK: Polity, 2001.
- Porter, Roy: *Enlightenment. Britain and the Creation of the Modern World*, London: Penguin Books, 2000.
- Porter, Theodore M: *Trust in Numbers. The Pursuit of Objectivity in Science and Public Life*. Princeton New Jersey: Princeton University Press, 1995.
- Ravetz, Jerome R: *Scientific Knowledge and its social problems*. New Brunswick and London: Transaction Publishers, 1996 [1971].
- Shapin, S. & Schaffer, S: *Leviathan and the Air-Pump. Hobbes, Boyle, and the Experimental Life*. Princeton New Jersey: Princeton University Press, 1985.
- Wood, Gordon S: *The Radicalism of the American Revolution*. New York: Vintage Books, 1993 [1991].