RISKS IN USING BIBLIOMETRIC INDICATORS FOR PERFORMANCE EVALUATION OF SCIENTISTS

Douhomir Minev

Abstract: *The issues being discussed in this article are the consequences of the use of specific (journal – or article - and researcher-based) metrics ("bibliometric indices") for assessment of the performance of scientists and research proposals.[1] The analysis is focused on the potential of the use of such indices to operate as a mechanism for control over the production of knowledge.*

The methodology is based on the complexity of relationships between sciences as systems for production of knowledge and their surrounding social environment. In these interactions arise motives for control and impact over knowledge production. The effects of these motives are expanding mechanisms for control over sciences and the knowledge they produce. The impact of the control mechanisms distorts knowledge and co-generates non-knowledge. When societies use distorted knowledge they face expansion of the so called "new risks".

On this basis "bibliometric indices" are identified as components of larger (in many cases - supranational) system for control over knowledge production (sciences' dynamics) and as generators of distorted knowledge and unexpected and negative consequences (new risks) for societies.

Keywords*: control (over sciences and knowledge); crisis of sciences; social knowledge; distorted knowledge, non-knowledge; new risks; bibliometric; academic assessment.*

Introduction

Although the use of journal-based and other (article- and researcher-based) metrics is not a radical innovation in assessing the work of scientists, the practice of assessments experienced important changes during the last decade – a trend of strengthening the impact of the metrics through: a) expanding the scope of the metrics' application - use not only for the award of academic degrees and titles (the pursuit of individual scientific careers), but also in regularly conducted appraisals of scientists and evaluation of research projects; b) applying them often is compulsory (special standards have been set up and sometimes - by law); c) a key driver of this change are the governments (state institutions) etc.

The combination of these changes outlines a trend - the extensive introduction of a new system for performance evaluation of scientists.

As a result of the pressure of governmental institutions and other key actors, the trend spread in many countries in short period of time, despite the skepticism and criticism of scientists and their organizations[2].

[1] Two earlier versions of this article were presented at two seminars on the use of bibliometric indices during assessments of scientist' performance – one of them organized by the Union of Scientists in Bulgaria and the other one – by a department at the Institute of Mathematics & Informatics at BAS, 2013.

[2] For instance, the American Society for Cell Biology (ASCB) together with a group of editors and publishers of scholarly journals launched a new initiative – the San Francisco Declaration on Research Assessment (DORA) - to make academic assessment less reliant on the impact factor.

Obviously, the system is given special importance because the objections were rejected and did not dissuade its introduction.

When, despite the doubts about the adequacy of the indicators per se and objections to the manner of their use, the institutionalization of the new system is imposed by dogged decision making centers, a number of questions arise: why the system is being so stubbornly introduced; what are the motives for introduction; what could be the implications thereof?

The State of Science and Production of Knowledge

"If there is such a thing as a Durkheimian conscience collective existing on a global scale, it is perhaps best represented by the widely held sentiment that we are living in a time of unprecedented danger. Although the chances of premature death or disability are probably no greater today than in any other periods of human history, the dangers we currently face are unique in two respects - they are caused by humans and their impact on us has a collective, rather than individual nature" [Lyng, Stephen, 2008, p. 106].

Many researchers search for the causes of these dangers in the existing knowledge, respectively - the state of science and the way they produce knowledge. Today is a widespread view that the systems of production of knowledge are experiencing crisis and produce uncertainty and ignorance rather than knowledge, and that if this trend continues, the future of societies will be determined more by ignorance and non-knowledge rather than knowledge. Among the proposals in response to this problem are identified two main ideas: either to slow down the production of knowledge or to reconstruct radically sciences and move on to post-academic (post-normal) science. The differences between the two proposals arise from the different diagnoses of the causes of the crisis in the production of knowledge.

The first proposal is based on the view that the cause of the crisis is the too rapid advancement of knowledge (too intensive production), therefore a slowdown in production is proposed and the most effective means of delay is reduction of resources or reduction in efficiency.

The second proposal (for reconstruction of sciences) stems from another cause of the crisis - the very 'means of production' of knowledge is already obsolete. The said obsolesence is due to a lack of connections with the moral values and the knowledge generated beyond the borders of science. It is therefore proposed a transition to a post-academic (post-normal) science, which operates based on the close relationship between scientists and the public [Funtowicz S. and Ravetz J., 1992]. Nevertheless, the question arises of the cause for breaking the links between moral values and knowledge that is created and exists outside of science itself? Many studies show that the problem is a fundamental and most common feature of today's production of knowledge - distorted relationships between power and knowledge, and more precisely - hypertrophied power control over the production of knowledge (some speak of vicious union between power and knowledge, other - of symbolic power, etc.) The reason for control is quite simple – as far as everything that people do intentionally depends on their knowledge, the control over creation of knowledge, allows to control everything that people do, and without them knowing that they are controlled (Note 1). Today this control mechanism has reached enormous proportions and complexity, but it is poorly studied, although remarkable minds are engaged in one or other sides of the power-knowledge relationship (mostly - Bourdieu, but also Foucault, Merton, Guldner and many researchers of risks). The mechanism has been extended and enhanced, especially intensively during the second half of 20th century, and it is what deforms sciences per se and the knowledge that they create. The problem is that control submits the creation of knowledge to one main goal - stability of the existing social order, in particular – preservation of positions of power elites who control society, and thus the created knowledge is inevitably distorted.

The Mechanism[1]

Central component of the mechanism are specific groups of scientists operating within science and influencing the way it functions, so that science creates knowledge, which meets certain requirements for the stability of the social order. Although they are difficult to distinguish from ordinary cliques commonly found in the sciences, these groups were noticed long ago (Alvin Guldner called them 'old people', P. Bourdieu – 'conservative ideologues', etc.) as a kind of 'proxies of power' in science. Influence that conservative ideologues have on knowledge production occurs along several lines: a) through influencing the basic elements constituting science itself as a system for production of knowledge (paradigms, theories (available or missing), approaches, principles, methods, sub-disciplinary structure, validation methods (recognition of obtained results as scientific), mechanisms for performance evaluation and therefore – also for shaping the scientific careers of researchers, etc.)[2]; b) impact on the choice of the main problematic areas of research interests; c) influence on the preferred interpretations of available data etc.

The second important component of the mechanism is the external support for the 'conservative ideologues' in science. The main channels through which these external effects run are science policies (defining research priorities and funding of sciences); special forms of support for 'conservative ideologues' especially - financial support[3] and occupying key positions in the hierarchy of research structures; support for private research centers and (albeit rare) private funding of research in public institutions.

Effects of Control Mechanism

Continuous effect of the control mechanism has given rise to a number of 'extra' effects, among which may be mentioned in particular:

- Distortion of incentives for research and the evaluation of the contribution of individual scientists;
- Establishment and a very strong influence of informal networks and groups where central position occupy the 'conservative ideologues';
- Formal internal hierarchies become too 'strong' and generate a deficit of democracy in the work of scientific organizations;
- Weakening of the impact of basic moral values on the modus operandi of scientific communities and organizations, etc.

The final effects of the above features are undermining the scientific communities and their work, and increasing dysfunctions of scientific organizations.

The effects of control and the relationship between them were noted long ago. Here is, for example, what Norbert Wiener wrote about some of these factors, already in 1947: 'It is clear that the demotion of the position of the scientist from an independent thinker to a servant who is employed in a science factory and is morally irresponsible, has happened much faster and in a much more devastating way than I expected. This

[1] Different sciences have different effects on the structures of power and domination. Some sciences contribute to consolidate the groups exercising power through the development of technologies in the economy, technologies of war and technologies of monitoring and control over their own population. The effect of social sciences is quite different. Therefore, the outlines of the control mechanism most clearly stand out exactly in social sciences. But this does not mean that there are no similar problems in other sciences.

[2] It is not hard to assume, and there are series of indications confirming the assumption, that such groups are also particularly active promoters of the new system for assessing the performance of scientists.

[3] The noticed by R. Merton 'Matthew effect' (accumulation of funding with the same scientists and groups) is usually an indicator for intensive financial support of conservative ideologues.

subordination of those who have to think to those who hold administrative power is destructive to the morale of the scientist' [Wiener, N.1947; Salomon, Jean-Jacques, 1970, pp. 308-309].

Moreover, demoralizing the scientists and hierarchies has far-reaching effects - it upsets scientific communities and their activities. Scientific communities are group (collective) mechanisms for production of knowledge and assessment of the scientific validity and relevance of results. The above effects of control (mainly - hierarchies and demoralization) weaken the capacity of communities to create knowledge.

Furthermore, 'conservative ideologues' and joining opportunists form their inner circles, groups, networks, cliques, which gradually conquer key positions in scientific organizations, gain significant influence and dominance in decision-making and submit the organization to the purposes of the dominant groups instead to the common organizational and social objective for which an organization is established and exists.

Under the influence of the above changes organizations lose the capacity to produce adequate knowledge, to regulate and govern themselves and become particularly susceptible to external influences flowing through informal networks and hierarchies.

Under the influence of the control mechanism (the key positions of 'conservative ideologues'; distorted incentive system; demoralization of communities, etc.) scientists quickly learn what efforts and results are the best rewarded and concentrate on to them. That is how variances occur in the process of knowledge creation.

Generator of Risks

Distortion of created knowledge has different aspects, but the main ones are: slow production of (for example - a strong lag behind of social sciences), creation of limited knowledge, creation of knowledge, whose scientific and social relevance are disputable [Simon, H., 1957, xxiv]; knowledge that may be more useful for society is not created.

A certain dynamics can be seen in these processes. For example, in the 50s, the Nobel Prize winner, Herbert Simon stated as an issue the production of irrelevant, unusable, unnecessary and useless knowledge. But today (the beginning of the second decade of the 21st century), knowledge is not just useless - Stefano Zamani already indicated the harmful effects of the research and not of peripheral researchers, but of the last ten winners of the Nobel Prize for economics.

It is not a coincidence that an increase of fraud in science is noticed (particularly evident for the award of academic degrees and titles, but also in the creation of new knowledge). And that exactly is the generator of hazards unknown to the society.

Search for a Solution

From this point of view, there may be two main alternatives to the creation of knowledge: maintaining and even expanding controls over the process or refusal of the old strategy, dismantling of control mechanisms and redeeming the production of knowledge. Supporters of the delay in the production of knowledge, tend to the first option. Supporters of the reconstruction of sciences are closer to the second alternative, because in essence they propose substitution of the knowledge - power alliance with a new one - between professional knowledge producers and public.

Where does the new scientists' performance evaluation system tend to?

Technology of Control

There are several signs that the system possesses capacity to strengthen and enlarge the control over production of knowledge.

First important sign, for example, is the identification of research work (i.e. creation of new knowledge) with publication activity, i.e. dissemination of already created knowledge. Although the publication activity of scientists has always been used to assess their work and performance, in the new system scientists can no longer present the results of their research that are not published or were not published in 'prestigious' journals, cannot submit the respective documentation proving that these results have been successfully tested for their scientific relevance and validity within a scientific community and cannot use these results in appraisal or for promotion in their career. Even if the results are very good, this does not affect directly the evaluation of scientists because of the compulsory requirement for a specific form of presentation - through publications and at that in certain (so-called prestigious) journals and editions. In fact, the main change is that the results obtain approval of another 'validation center'.

However, the first objection is that in this way research work is not only identified with publication activity, but the one is substituted by the other. Such substitution is not only devoid of solid arguments, but also gives rise to a series of negative effects. Important questions in this regard remain unanswered: why dissemination of created knowledge is imposed as an obligation of the researchers (often - without asking their consent or just at least their opinion, and sometimes - despite their objections); why their performance appraisal should be more dependent on the fulfillment of this obligation incumbent upon them than by direct and substantive assessment of the way scientists perform their primary duty - to produce adequate new scientific knowledge; whether such substitution would not cause a decline in the usual, long tested and established procedures for verification of the scientific validity and relevance of the results achieved and how this (possible) decline would affect the knowledge produced and the societies that use it.

This substitution gives rise to several important effects. Firstly, is reduced the role of essential, direct and qualitative evaluations of scientific validity and relevance of the created knowledge, carried out in the relevant scientific communities. Direct substantive judgments of communities are replaced with indirect evaluations based on publication activity. Secondly, arises a kind of 'disempowerment' of scientific communities (respectively - the organizational structures in which they operate) because their judgments are substituted by journals (respectively – their editors and reviewers). Thirdly, emerge new 'centers of influence' with regard to the scientists and their work – the editors and their editorial apparatus. Thus, the substitution of substantive direct evaluation of scientific results with indicators based on publication activity actually shifts centers of judgment: from scientific communities (their organizational structures) to the editorial boards of the journals and then - not all editorial boards but mainly those with the highest rating[1]. Moreover, the location of these new centers of influence can be easily 'lifted' – at supranational level - by encouraging publications in foreign and international journals. Thus arises a sort of 'globalization' of the control (actually - centralization), whose reasons are not clear (scientists are increasingly sharing their results regardless of this system), but some of the consequences are pretty clear. Fourthly, where attributes (rating) of the journals in which research is published affect the performance evaluation of the scientist, this generates pressure to publish in appointed journals.

The biggest problem posed by these effects is that publication activity and publication success of scientists (i.e. the creation of knowledge) are in relationships that are (or at least - can be used as) technology for control over the production of knowledge. The technology is based on the possibility of the creation of knowledge to fall under the influence of factors of not strictly scientific nature. Some factors may even have anti-scientific nature.

[1] Major role here has the well known impact factor, but sometimes the scientist's appraisal system includes also other indicators for ranking, for example whether the journals are national, foreign or international.

The falling of scientific work evaluation, and thus the scientific work per se, under the influence of non-scientific and even anti-scientific factors is not only evidence of the exercise of extra-scientific scrutiny, but inevitably leads to distortions in the production of knowledge.

Components of the Technology – 'Predispositions' of Selectors

Scientific journals can significantly influence the work of scientists. This possibility arises from the fact that in addition to the formal requirements of the journals to published materials there is also a wide range of informal requirements, which are not presented and are not formally put forward, but are applied quite strictly. These requirements are of cultural, ideological and political nature. Experiencing the pressure from the new evaluation system, scientists are beginning to adapt their work to the informal, unannounced requirements of the publication sphere (the journals). And in this way production of knowledge is influenced by non-scientific, even anti-scientific factors.

The system of informal requirements arises because the setting up of editorial boards of journals (respectively - circles of reviewers) and the way they work, stay far away from monitoring, participation and control by the scientific communities. In any case, it is possible (and this exactly happens) journals to selected authors and publications expressing certain views, predispositions, biases and even prejudices.

A remarkable fact illustrates the problem very well: many years ago, a legend in the economic analysis – V. Leontief (Nobel Prize winner), noted that the market theory has lost its connection with economic realities and that this poses a major risk for the very science of economics and economic policy and for the economies themselves. In protest against this distortion in knowledge, Leontief ceased to publish in the 'prestigious' economic journals because they were premeditated (uncritical) of the theory and especially contributed to the dominance of this mainstream of economic analysis. Thus, they contributed to the occurrence of the gap between theory and reality, through intensive dissemination of theoretical achievements of market theorists who are now more often called 'market fundamentalists'.

Another famed case also illustrates the above. Alan Sokal, a physicist at New York University, perceiving certain characteristics in the work of the journals, perpetrated a special hoax to highlight them. He submitted to a scientific journal (*Social Text*) an article entitled: "Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity".

The article was nonsense, deliberately compiled of fawning references structured around the silliest quotations he could find about mathematics and physics, but the magazine published it. The reasons for this, according to Sokal himself are two: "it sounded good and flattered the editors' ideological preconceptions". Knowledge researchers believe that this experiment of Sokal proves that 'the selection of articles to be published is highly dependent on political, social and cultural elements' [Bucchi, M. 2004, p. 95].

It is because of these dependencies, scientific journals of the highest rank often distort the most powerful tool for evaluating scientific results – the peer reviews. The above listed scientific organizations and their best practices in peer reviews show that the results of this evaluation procedure of scientific achievements are much better if the procedures are carried out within the scientific communities - especially where corresponding results are established.

However, particularly this adequate tool does not yield good results when applied in journals. A ruling on this issue was issued by no other than the U.S. Supreme Court. In one of its judgments it enacted that 'peer reviews' in journals can present deformed, distorted judgment. The same, only more emphatically, claim and scientists themselves. Chubin and Hackett point out a research, which shows that only 8% of the members of the Scientific Research Society (USA) have expressed the opinion that the method of peer review in journals gives good

results. Obviously, arises the question of why the same tool gives different results in journals and in academic communities? The answer seems to lie in the fact that those who select works for publication in journals select them according to their ideological, political, and cultural predispositions.

Summarizing the above, it can be said that by the ratings of journals can be created (and are created) invisible hierarchies, hierarchical tiers in the publishing system, and these hierarchies are transferred to the very production of knowledge in the sciences themselves. When this happens, in practice are arranged hierarchically strands of research paradigms, theoretical constructs, methods, scientific communities and groups, and what is especially important - ultimately hierarchically are arranged also scientific results, various segments of created knowledge. This hierarchy is different and may have completely opposite structure to the real alignments based on the essential, direct evaluation of validity and relevance of research results. There are empirically established facts that confirm this statement.

The Australian Research Council has published the results of comparisons between the official (formal) values of the impact factor and the special expert assessments of the impact factor of one and the same journals. Large groups of experts have been involved for this purpose from various scientific organizations, including the Australian Academy of Science.

170 journals with impact factor in Applied Mathematics were subject to such appraisals. The results of the comparisons are quite eloquent.

It turned out that the impact factor values hardly corresponded to the evaluation of the experts. There were examples of journals that have a higher impact factor than others, but according to the expert assessment the values of the factor were found to be at a much lower level. Out of 10 journals with the highest values of the impact factor, only two journals have received the highest expert assessments. And the journal, which by its impact factor was considered the best in applied mathematics, according to expert assessment proved at a much lower level. This remarkable discrepancy between the impact factor of journals and expert assessment of their quality is usually explained by inaccuracies in the calculation and even deliberate falsification of the impact factor [Amin M. & M.Mabe, 2000, p. 3].

When the differences between the two evaluations of the validity and significance (usefulness) of created knowledge - formal bibliometric evaluation and substantial expert evaluation - go beyond a certain threshold, the normal, socially beneficial development of sciences themselves is blocked and deep distortions occur in the created knowledge.

Here are some more details about the risks of placing the performance of scientists, i.e. production of knowledge, under the strong influence of the above features of the publication sphere.

Promotion of Correct Scientists and Knowledge - "Conservative Ideologues", Networks and Self-Citations

The new system for performance evaluation of scientists gives special chance to the networks of 'conservative ideologues'. Studies of the new system often identify them as clusters (cartels) for self-citation and define them as follows: "Group of authors who have agreed on specific scientific or research methods, definitions or conclusions and cite only themselves or authors agreeing with them and ignore authors who disagree with their preferred methods, definitions or conclusions". These clusters are not simply mechanisms for trading on the deficiencies of a thoughtless and weak system of performance evaluation of scientists. They are much more dangerous phenomenon that has the potential to have a negative and a strong influence on the process of knowledge creation and on the result of this process - the knowledge itself. And there is evidence that they exert such influence and give rise to serious distortions in the structure of published knowledge, and through it - on the directions of scientific research.

Opportunities for such influences increase dramatically when the cartels establish close connections with (or conquer through their representatives) editorial boards and publishers of journals of 'high prestige in the publication market'. Over time, they inevitably begin to control not only publication, but the entire production of knowledge in a given field, directing it to the track of their group preferences.

For the increasing influence of self-citing cartels on the production of knowledge can be judged also by studies that show that the introduction of bibliometric evaluations intensifies the 'Matthew effect' – who follows the dominant 'fronts', receives the adequate reward.

Therefore, ultimately placing bibliometric indicators in the foundation of mandatory regular appraisals and evaluation of projects not only allows but also reinforces the capacity of organized networks (groups, clusters, cartels, cliques, etc., i.e. forms of organizational structures of 'conservative ideologues') to influence: the direction of research, dominant paradigms, scientific tools used to create knowledge, and therefore - to influence the process of knowledge creation, and hence - on the actual content and structure of the created knowledge. These are the outlines of a broad system for controlling knowledge and therefore - for its manipulation.

And this is a total failure in the creation of knowledge - control brings forth the change that was mentioned - institutionalized and specialized systems for the production of knowledge begin to produce indeterminacy and ignorance rather than knowledge. There are many signs for such dynamic.

The European Society of Life Sciences states that "the annually published impact factors of the referenced journals are averages based on many publications and publishing in a journal with a high impact factor does not guarantee that each publication is cited equally often". Critics of Hirsch index produce many data showing that the index stimulates the establishment of networks of authors who cite each other. But that is not all. Prof. Georgi Angelov emphasizes that a few years ago in the ranking of life sciences according to the indicator 'number of citations per one paper' Bermuda was at the top, followed by Panama, Gambia and Gabon at the leading places. This ranking may be contrary to common sense, but it shows what the rules for registration of citations are capable of. Moreover, even if the rules were perfect, it is evident that the ultimate judgment of the scientific relevance of performance can be manipulated in other ways. Therefore, deep doubts arise regarding the adequacy of registration rules and whether they reflect only the scientific relevance of certain research results or registration is influenced by other, poorly known (perhaps even - completely unknown) factors.

Professor Anne-Wil Harzing of the University of Melbourne focuses her analysis on the published by Thomson Reuters Highly Cited Papers List covering 1% most cited papers in a given discipline in a given period and illustrates the effect of the List with a case, which he called "super author". The latter has collected 512 citations, reflecting references to his work in 169 papers of other authors or networks of authors. Therefore, each paper that has cited the super author has cited at least three of his publications. Although repeated references in a paper to the work of one and the same author are not uncommon, more than three references seem pretty much. Even more interesting is that citing authors form narrow and highly self-referencing clusters. Moreover, the percentage of self-citation of the super author is also quite high - about 30%.

Professor Harzing wonders whether "this is a success story of a highly productive author or rather more complex and disturbing story of systemic impact of a series of 'innovative' and in a sense - abnormal decisions that seem to have the potential to change the very nature of the way in which scientists and the academic are perceived and evaluated?" The question is of course rhetorical. The truth is that this is a system that allows rapid scientific "successes" (respectively careers) regardless of the scientific validity and social relevance of the achieved scientific results. In the center of the system stands a consolidated network for self-citation. Harzing also points out the main components of the model of (self-) citations: a) **exceptionally high proportion of self-citation of journals** - 85% of the 512 super author citations are in the same journal in which he himself has published his works. As for his 10 most cited papers that percentage is 93. It is also quite interesting that his 10 most cited

articles are not cited in other journals nor have only one citation; b) **exceptionally high proportion of self-citation of publishing companies**. 94% of the 169 papers citing the work of the super author are from the same publisher (*Academic Journals*). Only 10 citations were made in journals published by other publishers. Seven out of these 10 citations were made in a journal from the network ANSI Network's journals (another publisher with open access, which analysts consider "predatory"); c) **mutual citation authors - you cite me, I cite you**. Those 169 papers that cite the super author were cited in turn in other 165 papers. Only 7 papers out of those 165 do not cite papers by the super author. Thus, 158 of these 165 articles cite both the super author and the papers that have cited him.

It is especially important that 'the cartel of citation' managed to declare papers of the 'super author' an important line of research (a research front) and the effect is the resulting implicit requirement - if you want to be a successful scientist, follow the 'front' – either this one or some other that may be formed in the same manner.

Journals, Control and Deformation of Knowledge

It is often argued that the scientific quality of publications in journals with high impact factor is also very high because the results proposed there are subject to precise and highly qualified reviewing. We have seen that this statement can be deeply misleading and in many cases it really is. Indicators themselves really seem objective, but the factors that determine the values of these indicators are hardly 'objective' - they may be subject to targeted, 'subjective' effects i.e. to manipulation. Therefore, several observations suggest that, in fact, objective evaluation is not achieved and that achieving such an evaluation is difficult.

When the selection of material for publication is heavily dependent on "political, social and cultural elements", this simply means that the journals perform selection depending on the ideological, political and cultural predispositions of their editorial boards and reviewers they attract for their Peer Reviews. Hence, the judgment of the reviewers and editorial boards of journals in the U.S. is so distrusted that even the Supreme Court has registered this fact. But when the performance of scientists is evaluated according to its relevance to the 'predispositions of publishers', the selection mechanism turns into a mechanism of control - censorship. Then the selection of materials accepted for publication will not depend on scientific validity and societal relevance of the results, but will depend on the 'predisposition' of selectors. This distorts the whole process of publication in which some results become public with advantages arising not from their scientific value but from other factors.

When this distortion of the publication process is combined with the forced inclusion of scientists in it (and the strong influence of successful inclusion on the evaluations scientists get and on their career), the result is clear - the work of scientists is 'distorted' and more precisely - the process of creating knowledge is distorted.

In general, distortions in the selection and dissemination of knowledge (publication process) become distortions in the production of knowledge - whoever wants to be published must produce results that meet certain extra-scientific requirements. Therefore, scientific journals (and the strong requirements to publish therein) can play a key role in the distortion of creating knowledge. And (especially in social sciences), the journals really play such a role, moreover, there is strong interest in the intentional distortion of knowledge about societies. How far this gap has gone, for example, between economic realities and dominant trends of economic analysis and the consequences thereof, can be seen very clearly in the economic crisis since 2008.

The Bibliometric ACTA

Obviously, the impact factor and other bibliometric indicators are not at all sound and 'objective' indicators for assessing the performance of scientists as it is claimed by their 'promoters'. The latter are either ignorant or just cheat, pursuing certain goals of their own.

In fact, the above weaknesses in formation of bibliometric based evaluations indicate that the new system for performance evaluation of scientists has great potential to enhance control over the research and with this to cause an extremely negative trend for the substantive evaluation of scientific validity and relevance as well as of the social usefulness of scientific results to lose its significance and be replaced by indirect and subject to manipulation 'objective' indicators that can direct the creation of knowledge even at supranational level. As a result, scientists and scientific communities 'adapt' to the demands made on them (and take advantage of their weaknesses); research careers are less and less dependent on achievement and are more and more developed under the influence of surrogates, which in turn reflect the influence of other factors of non-scientific nature (mostly - expectations and predispositions of those who control the journals).

Sokal's hoax is not an isolated case and reveals the effect of a comprehensive mechanism for biasing the process of dissemination of knowledge.

It is not hard to notice three main tiers in the system of control over the production of knowledge. At the first tier (individual scientific institutions) a central role play the statutory systems for individual performance evaluation scientists – appraisals based mainly on bibliometric indicators related to their publication activity. The second tier comprises evaluation of the scientific organizations themselves. At this level governments (respectively - ministries) create a regulatory framework for a national system for performance evaluation of scientific institutions - universities and research centers. Both the national and the individual systems have the same pillars - bibliometric indicators. The third tier is supranational and covers all countries that have joined the system. At this level operate international scientific journals with various rating (especially those with high and very high impact factor). An important component of this level is a private rating agency, which gains tremendous opportunities to control the creation of knowledge as it ultimately decides what knowledge (which results) will receive the stamp of scientific validity and which will not be validated. Thus, a private corporation may determine the main directions in which knowledge will be created; the structure of this knowledge; the results that are acceptable or not – and against criteria only they are aware of.

Since practically they will issue certificates of scientific validity of research results and will control and direct the creation of knowledge, private rating corporations usurp (monopolize, 'privatize') a function with fundamental societal importance - the function to determine the development (direction of progress) of knowledge and the structure of general knowledge – the shares of individual sciences and the knowledge they create within this structure; the share of the different directions in various sciences and sub-disciplines and also - what will be the impact of different paradigms, theories, empirical data etc.

The three tiers are connected in a complete system through the same indicators. Since high scores at the first two levels (organizational and national) receive only those scientists and scientific organizations that have been approved at supranational level (i.e. publish in prestigious selected journals), it could be said that it is over-centralized system for controlling and directing the production of knowledge.

This system is essentially an analogue of the famous Anti-Counterfeiting Trade Agreement (ACTA) – a large scale system possessing capacity for control and restriction of freedom[1], but in our case – for control, direction and restriction of knowledge creation and especially – restriction of social knowledge. It is natural that such a system raises concerns.

Not only the components of the system described above raise concerns, but also the way in which it is being deployed - in parts, at the different levels, quietly, not described as a complete system, without an explicit formal

[1] The initiators of ACTA pretended to establish international standards for intellectual property rights enforcement. Additionally, this international legal framework aimed at **creation of a new governing body outside existing forums.**

document (as was the ACTA) that officially states: "we are setting a new system for evaluation and steering the development of science and knowledge, the reasons for its introduction are these, we expect to obtain the following effects of its introduction". Instead, the system is developed silently, in the dark and the participants see only the parts of the whole, but do not link them together. At the ministry is developed a document for a national evaluation of research units (naturally - based on impact factors and citation indices); at universities and institutes is introduced a system of individual appraisal (again - impact factors and citation index) and at supranational level is created the mechanism that forms the indicators i.e. will issue certificates for proper science and correct knowledge.

Side Effects of the System - Deformations of the Publication Field

The bibliometric evaluations raise certain deformities in the publication field.

A) The emergence of "predatory journals". One particularly deformed phenomenon that arose from a hypertrophied role of bibliometric-based evaluations is the emergence and rapid growth of 'dark sector' journals (*predatory journals*), whose main purpose is to profit from the pressure that is exerted on scientists to publish as much as possible in foreign journals. The system for performance evaluation of scientists and the results thereof, literally push scientists to these journals. A practice was born as a result, called "bait-and-switch" - scientists receive attractive invitations to publish in a journal, but then it becomes clear that they have to pay considerable sums for publication (reasons for asking for payment are different). Particularly easy victims are scientists from peripheral countries, where the pressure through requirements for publications in foreign (mostly - international and therefore 'by definition' - prestigious) journals is particularly strong. A typical example: "Nigerian scientists are particularly pleased with these invitations because the National Universities Commission (NUC) now require for promotion of lecturers to status of professors to publish some of their work in international academic journals". And of course add that the requirement affects very badly the Nigerian academic community. The same could easily be written for the Bulgarian academic community and for any other community that is placed in similar circumstances.

Of course, these journals publish everything that has been duly paid for and are less concerned about the adequacy of the knowledge that comes through in their published articles. Scientists report the case of a teacher at the Benue State University, who in an interview with *The Guardian* (Guardian, July 28) announced that in an article published in a scientific journal he presented a solution to a 262 - year old math puzzle. As it turns out, the journal (its editorial board and reviewers) was not very concerned about the trustworthiness of the proposed solution.

However, even very sound journals that do not belong to the above group ask their authors to pay some amount to provide open access to their publications. This request has a very good reason and it can not be seen only as a 'deviant behavior' of journals. But this practice still shows how scientists are burdened with costs when publication activity becomes of too high importance for their valuation and becomes incumbent upon them. Moreover, as the number of citations depends on access, paying for open access ultimately affects the evaluation of the scientist. And this factor in the evaluation is definitely of no scientific nature. Naturally, the 'most cited' are the most solvent and solvent are those who have access to generous funding (projects). In turn, access to projects (Bulgarian experience is a good example) is often organized in a special way for special players, especially in the social sciences.

B) Scientific journals that are designed to meet the new requirements. Cases as the above are not found only in the journals - money making machines. The binding nature of 'bibliometric evaluations' in combination with their strong influence on the careers of researchers may give rise to similar effects in 'normal' journals designed for other purposes. For example, in the literature we find the case of Journal of Applied Pharmacy, published by

Intellectual Consortium of Drug Discovery & Technology Development from Saskatoon (Saskatchewan). The journal is not a money making machine, but was set up by Pakistanis living in Saskatoon to help Pakistani scientists to gain the necessary levels of 'bibliometric indicators' that are required by the Higher Education Commission in Pakistan. The journal became famous because of the case of a young and very active researcher who achieved very high 'bibliometric values' through articles published in that same journal. A review of her articles, however, showed extensive repetitions in "various articles" and "borrowings" whose sources were not indicated. In one of the articles the author in question claimed that some plants were not harmful and even had beneficial effect, but the problems in her own publications have led scientists to doubt whether her scientific 'discoveries' could be trusted. And what might have been the consequences if they were? Obviously, such practices can create a false scientific validity and relevance of the achievements of a scientist.

C) Prestigious journals and their rating. The main prerequisite for the occurrence of the above problems in publication of scientific results is that the impact factor of journals could be subjected to manipulation and, as shown by numerous observations, these opportunities are widely used. Even journals that do not fall into the above two categories and are considered prestigious use them - staggering facts of such falsifications have been found and at that for journals in the area of exact and life sciences. The above mentioned experiment conducted by the Australian Academy of Science is clear evidence of such deviations associated with the use of 'objective' bibliometric indicators in the field of mathematics. And what happens in the journals in the field of social sciences? The same, of course, but it is many times worse.

D) Forgetting the overall aim

The dissemination of research results through 'high prestige journals' is prone to adopt an increasing profit orientation that transforms the publication area into a large-scale private industry. The tendency is definitely in incompliance with the fact that many of the journals in one extent or another is supported by donations. This criticism is made by no other than *The Economist* [14 April 2012], which poses the question why funds from donations are used for the formation of a large private industry making profit. The criticism of "The Economist" highlights the important role played by private corporate body (e.g. Thomson Reuters Corporation) in the maintenance of database on registration (counting) of publications abroad and the citations networks.

Actually, *The Economist* points also to another, more important issue that 'promoters' of the performance evaluation system of scientists have forgotten - that the knowledge created in social sciences should be freely available to the public and not a commodity used for making huge profits because in this way it becomes difficult to access (R. Merton long ago paid attention to this already well-forgotten fact). Transformation of social knowledge into such commodity not only transforms the process of production of knowledge on society but also distorts the knowledge itself. Distorted knowledge raises inconceivable serious consequences because in its essence it is intentionally generated and maintained ignorance and non-knowledge.

The above stated explains why the striving to replace the system of direct and substantive evaluations of created knowledge with 'bibliometric' surrogates gives way also to the usual effect (and indicator of problems in science) - a growing number of scientific fraud. These have always existed, but in the recent decades they grew explosively. There is an abundance of cases like the one with A. Sokal or the teacher, who solved the 262 - year-old mathematical puzzle, or the mentioned assertive worker on the scientific front, lavishly publishing the inventions of the medicinal properties of various plants.[1] But an increase in fraud is still the lesser trouble - these are subject to relatively easy detection. The big trouble is another one – creation of social mechanisms for systematic control

[1] Disclosure of such fraud began to affect individuals with academic degrees from the highest ranks of political power – such scandals caused a sensation in Germany.

and distortion of knowledge continues - particularly in the social sciences, and these mechanisms are difficult to identify and the consequences are severe.

Social Sciences - a Particularly Vulnerable Field for Bibliometric Evaluation

Undoubtedly, the above-described system presents a serious threat to all sciences, to the knowledge created and to society that use that knowledge. This threat is particularly strong for social sciences and the knowledge created by them, because of their high vulnerability to such a system. And it is no chance that social sciences are considered the most inappropriate field for use of bibliometric evaluations - that has been emphasized both by scientific organizations, and individual researchers. As main reasons for social sciences'high vulnerability can be pointed as follows:

A) Unlike other sciences the knowledge generated in the social sciences can influence directly and strongly to social change and sustainability of the social order. Therefore, these sciences are exposed to particularly strong interest in the control of the created knowledge and control inevitably and automatically distorts the created knowledge. Thus emerged a specific model of development of social sciences, which may be called Preventive Model, because its nature is to adapt the creation of knowledge to requirements for stability of the social order by controlling and limiting the creation (and dissemination, transfer) of knowledge on certain aspects of social realities. The model covers all social sciences but it is especially noticeable in sociology, the most general social science. Preventive Model includes several components: the internal structure of science, the activity of specific groups of scientists, external influences on the process of knowledge creation (scientific policies turned the social sciences into Cinderella in the family of Sciences).

The traces of interventions through which the model was built are particularly evident in the internal structure of sociology (the set of paradigms, theories (present or missing), approaches, principles, sub-disciplinary structure, the rules of scientific work, including methods of validation (recognition of results of research), mechanisms for evaluation, and therefore - for the development of the scientific careers of researchers, etc.). These components comprising the science itself have gradually been constructed in such a way that science create knowledge maintaining the protective shell of non-knowledge about key aspects of social realities. Thus, through the very instruments for creating knowledge, knowledge has been actively restricted (ignorance supported) on the central aspects of societies.

B) Due to the above, in social sciences are particularly well developed and are unusually active groups of scientists whose primary role is to support the creation of "appropriate" knowledge, which stabilizes the social order. It is they who steer the mainstream of research and they are the main reason that made Norbert Elias to notice long ago that sociologist experiencing some 'inexplicable love' to the existing social order. Today these groups form particularly strong 'clusters (cartels) of citation' and are particularly clearly visible in the face of so-called 'think tanks'. No less dangerous form of their existence are also the informal networks in research organizations. Bibliometric evaluations are especially beneficial for these groups as they are able to not only act as cartels of citation, but to use the support of special scientific journals and external financing bodies. Academics, who do not belong to the network of cartels will be quickly forced to join in the game, otherwise they will end up with lower grades than the members of these structures;

C) Compared to other sciences, social sciences have less possibilities (approaches, criteria, procedures) for verification of the scientific validity of created knowledge and are therefore less 'protected' against major distortions thereof. This gives an unusual freedom of all 'guiding influences' - policies, publishing institutions, networks of cartels of citations etc.

D) The above characteristics have given rise to specific "Standard Model" of social research, spotted by Reynolds, Turner and many others. Steven Pinker also emphasized on the existence of standard model of social research and indicated the main effect of it: "Leading social researchers can say any nonsense as long as they conform to the standard model of the social sciences. .... hard to believe that the authors believe in what they say. Statements are made without regard to whether they are true. They are part of the Catechism of the century. ... Modern social comments remain based on archaic concepts ..." [Pinker, S. 1997; p. 57]. The model expands and 'normalizes' an effect, which the economist (and Nobel Prize winner) Herbert Simon had long ago noticed and discussed - the production of knowledge about secondary, minor issues i.e. irrelevant, useless, unnecessary, contradictory and uncertain knowledge (Note 2). Recently (April 19, 2012) *The Guardian* identified the same problem again. Looking through the site of the British Sociological Association, the author of the article found that there was not a single message related to the crisis in the EU and UK. Instead, the Association has published the 'fundamental results' from a study that "older bodybuilders can change the way young people perceive those who are older than 60 years." The author of the article has also checked the sites of three journals with quite high impact factor: American Sociological Review, Sociology (the leading sociological journal in the UK) and the British Journal of Sociology, having run a search on the keywords "finance", "economy" and "markets" for the entire last decade. In ten years, the first magazine has published 9 articles (another question is what exactly they contained) in the second were published 3 articles containing these keywords and in the third - one. In short, the three journals and have not been able to publish anything substantial on the issue that is essential for whole Europe. The central problem is referred to in the title of the article: "The Crisis is a Failure of Academic Elites".

Exactly here are the roots of other problems noted by risk analysis – the already mentioned generation of ignorance and the 'politicization' of knowledge; the falling behind of social sciences in comparison with others; the crisis of sociology; the emergence of a rift between the social realities and their scientific representations.

Therefore bibliometric evaluations are not able to restrict the creation of low quality, socially irrelevant, lacking in capacity for positive social functionality (even meaningless) knowledge. Moreover, such knowledge can be considered as knowledge with a reasonable degree of scientific validity and positive social relevance precisely because of the hypertrophied use of 'bibliometrics'. As pointed out by the said article into *The Guardian* - scientists embroider pieces for prestigious journals while a deep crisis shakes societies that scientists are called to study.

The above leads to the conclusion that bibliometric evaluations expand and institutionalize the Preventive Model for control over the created knowledge and therefore have the potential to further deteriorate the situation of social sciences. This in turn gives rise to unknown threats to society.

Conclusion: Threats to Societies

The widespread opinion that the financial and economic crisis is a failure of the academic elites was confirmed by the same academic elites on a special occasion, which quickly became known throughout the world. Visiting the London School of Economics the Queen of Britain asked why scientists have failed to foresee the crisis. Professors from the School failed to answer at the moment, but in the ensuing debates, one of them gave the obvious answer: "People do what they are paid for." This brings to the front the issue of the elaboration of science policies and research programs that fund research irrelevant to the most important risks to society.

The case is just a small example of a bigger trouble - these policies, together with the factors considered above have caused the 'discrepancy' between social research and knowledge on the one hand, and social realities (including the most acute problems of societies) on the other hand. This societal irrelevance and futility of the leading mainstream of social analysis is extremely dangerous phenomenon - it simply means that the connection with social realities is lost, i.e. societies do not have enough knowledge about themselves. And the loss of such a

connection contributes to the stabilization of the social order, but on the other hand gives rise to decline in the rationality of societies, understood as the capacity of societies to identify risks in time and to set up adequate systems to neutralize them, to achieve development and to expand the boundaries of dignified human life. Therefore, the natural result of the decline in capacity to cope with risks is a blast of risks and the damage they cause to individuals and societies (Note 3).

Introduction of bibliometric evaluations in social sciences seems to be further enlargement of the control over sciences and knowledge and its effects will further aggravate the already very serious situation in the social sciences and the threats it poses to the societies themselves.

Therefore, it is the duty of the organizations of scientists, especially in the field of social sciences to warn societies about these dangers and make the necessary efforts to reduce them.

Notes

Note 1 The historical milestones that marked the recognition of the fact that control over knowledge is essential to control societies are well visible. Only a few names are sufficient to outline the gradual awareness of the potential practical use of control over knowledge to stabilize the social order: from Machiavelli (who clearly understood the importance of social differentiation of knowledge - the secret to maintain and exercise power); through Bulenvile (who expanded the idea, stressing the importance of control over knowledge to preserve power), Nietzsche (who was convinced that the "will to knowledge" is only a "will to power") to the explicit statement of social scientists published in scientific journal in the middle of the 20th century that "ignorance can be useful and potentially positive for maintenance of the social order" [Wilbert and Tumin, 1949].

Note 2 H. Simon gives the example of establishing a correlation between the number of unmarried older women in rural areas and yield clover crop. It was found that older unmarried women in rural areas often keep cats, cats hunt field mice and field mice feed on bumblebees that pollinate clover. Thus a larger number of older single women is associated with a larger number of cats, less mice and higher yield of clover seed. The conclusion was that possible decline in the production of clover must be assessed before decisions are made for payment of benefits on marriage or family allowances in rural areas. Simon points out that such knowledge should be rejected and restricted because it creates unnecessary 'noise' hampering and even misleading the making of adequate decisions [Simon, 1957].

Note 3 A typical examples: almost immediately prior to the crisis of 2008, *Citigroup* ordered a large-scale survey aimed to determine whether the ongoing concentration of income is not in any way a threat to the stability of the financial system. Researchers noticed that in many countries about 20% of the population receive a significant portion of the income and have a decisive influence on the dynamics of saving, investment, on the structure of consumer spending, and therefore – on the market and production, i.e. - on the whole economic dynamics. Yet the conclusion from these observations was that there was no danger to the banking business, and the researchers explicitly acknowledged that they were not guided by any moral judgments.

The financial crisis occurred shortly after the completion of the survey. When the property market crashed, venture securities suffered billions in losses - 27.7 billion for *Citigroup* and had to ask for 45 billion from the Federal Reserve. The corporation shares collapsed by 77% in one year. Shareholders suffered losses of 700 million dollars. In October 2007, one share of *Citigroup* was worth 47 dollars. But in 2009 the price was already 2 dollars. Because of the losses, the shareholders brought a claim and sentenced *Citigroup* to pay them 590 million dollars.

APPENDIX

EUROPEAN PHYSICAL SOCIETY RECOMMENDATIONS

On the use of bibliometric indices during assessment, V - 11 June 2012

Recent years have seen quantitative bibliometric indicators being increasingly used as a central element in the assessment of the performance of scientists, either individually or as groups, and as an important factor in evaluating and scoring research proposals. These indicators are varied, and include e.g. citation counts of individual papers published by researchers; the impact factors of the journals in which they publish; and measures that quantify personal research contributions over an extended period such as the Hirsch Hindex, and variants with corrections such as the G-index.

Although the use of such quantitative measures may be considered at first glance to introduce objectivity into assessment, the exclusive use of such indicators to measure science "quality" can cause severe bias in the assessment process when applied simplistically and without appropriate benchmarking to the research environment being considered. Funding agencies are aware of this, nevertheless experience shows that the reviewing of both individuals and projects on the national and European level is still relying excessively on the use of these numerical parameters in evaluation.

This is a problem of much concern in the scientific community, and there has been extensive debate and discussion worldwide on this topic (see for instance [ARC, 2010]).

Since the very first applications of bibliometric indicators in this way, scientists and science organizations have taken strong positions against such purely numerical assessment. Various organizations in Europe have published studies on their potential adverse consequences on the quality of funded scientific research. A prime example is the publication of the /Académie des Sciences of the Institute de France /that has presented clear recommendations on the correct use of bibliometric indices [Bibliometrie, 2011]. Other publications have addressed the role of peer review in the assessment of scientists and research projects e.g. the European Science Foundation /Peer Review Guide /published in 2011 [ESF, 2011] with recommendations for good practices in peer review following an extensive European survey on peer review practices [ESF, 2011a]. Other recent examples are a study of peer review in publications by the Scientific and Technology Committee of the House of Commons in the UK [STC, 2011], the peer review guide of the Research Information Network in the UK [RIN, 2010] and the recommendations formulated at a workshop dedicated to quality assessment in peer review of the Swedish Research Council [SRC, 2009].

A common conclusion of these studies is the recognition of the important role of PEER REVIEW in the quality assessment of research, and the recommendation to apply bibliometric performance indicators WITH GREAT CAUTION, and only by peers from the particular discipline being reviewed.

The European Physical Society recognizes and takes note of these recommendations for unbiased assessment procedures, and emphasizes in the following those aspects that are particularly important (in some cases unique) in the context of the assessment of the performance of the work of physicists, and of the quality and originality of physics research projects.

1. Evaluation should exclusively be carried out by peers, who must be independent and must have no conflict of interest with the evaluation process. They must strictly respect a published code of conduct. Whilst recognizing the role of confidentiality in some forms of peer review, the names of evaluators should normally be made public, either before or after the assessment procedure as appropriate to the evaluation being carried out.

2. An unbiased assessment of the scientific quality of individual researchers or their projects using bibliometric indices must take into account many factors such as: the scientific content; the size of the research community; the economic and administrative context; and publishing traditions in the field. Publishing habits and traditions

significantly vary between different fields of physics research, and are reflected for example in areas such as the name order in the list of authors and the particular choice of the journals in which to publish. A special example is publishing in the field of physics with large facilities where traditions are very different from many other fields. For example, accelerator physicists publish their work essentially in conference proceedings, while only a small percentage of their work appears in peer-reviewed journals. Another example is the publication policy of the large collaborations of physicists in the field of experimental particle and astroparticle physics. These collaborations apply strict procedures for the assessment and endorsement of results by every member of the collaboration prior to the internal publication of results. The external publication of results is also endorsed by the full collaboration. As a consequence of this policy, their articles in refereed journals often have long author lists published uniquely in alphabetical order.

3. The annually-published impact factors of refereed journals are averaged over many papers, and publishing in a high impact journal does not guarantee that every individual article is equally highly cited. Such quantitative measures based on the number of publications and/or citation statistics of researchers are one aspect of assessment, but they cannot and must not replace a broader review of researchers' activities carried out by peers.

The European Physical Society, in its role to promote physics and physicists, strongly recommends that best practices are used in all evaluation procedures applied to individual researchers in physics, as well as in the evaluation of their research proposals and projects.

In particular, the European Physical Society considers it essential that the use of bibliometric indices is always complemented by a broader assessment of scientific content taking into account the research environment, to be carried out by peers in the framework of a clear code of conduct.

Bibliography

[Adler, Ewing, Taylor, 2009] Adler, R., J. Ewing, and P. Taylor, Citation statistics. Statistical Sciences 24, 2009, pp. 1-14.

[Amin M. & M.Mabe, 2000] M. Amin & M. Mabe, Impact factors: use and abuse. Perspectives in Publishing 1, pp. 1-6, Arnold, D., Kristine Fowler. Nefarious Numbers. arXiv.org, Cornell University Library, 2000.

[ARC, 2010] Australian Research Council, Ranked Journal List Development, 2010, http://www.arc.gov.au/era/journal_list_dev.htm.

[Begley, S. 2006] Begley, S., Science journals artfully try to boost their rankings. Wall Street Journal, 5 June 2006, B1.

[Bibliometrie, 2011] Institut de France, Académie des Sciences, Du Bon Usage de la Bibliometrie pour l'Évaluation Individuelle des Chercheurs, 17 January 2011, http://www.academie-sciences.fr/activite/rapport/avis170111gb.pdf - English version.

[Bucchi, 2004] M. Bucchi, Science in Society. An Introduction to Social Studies of Science. Routledge, 2004.

[ESF, 2011] European Science Foundation, European Peer Review Guide, Integrating Policies and Practices for Coherent Procedures, March 2011, http://www.esf.org/activities/mo-fora/peer-review.html.

[ESF, 2011a] European Science Foundation, Survey Analysis Report on Peer Review Practices, March 2011, http://www.esf.org/activities/mo-fora/peer-review.html

[Ewing, J.] Ewing, J. Measuring journals. Notices of the AMS

[Funtowicz & Ravetz, 1992] S. Funtowicz & and J. Ravetz, Three Types of Risk Assessment and the Emergence of Post-Normal Science. In: Sheldon Krimsky and Dominic Golding, Social Theories of Risk, Praeger Publishers, 1992.

[Golubic, R., M. Rudes, N. Kovacic, M. Marusic, and A. Marusic, 2008] Golubic, R. M. Rudes, N. Kovacic, M. Marusic, and A. Marusic, Calculating impact factor: how bibliographical classification of journal items affects the impact factor of large and small journals. Sci. Eng. Ethics 14 (2008), 41-49.

[Grant J. 2007] Grant J. Corrupted Science. Fraud, ideology and politics in science. AAPPL, Church Farm House, Wisley, Surrey, 2007

[Gross M. 2000] Gross M. The Unknown in Process. Dynamic Connections of Ignorance, Non-Knowledge and Related Concepts, Canadian Journal of Sociology/Cahiers Canadiens de sociologie, Vol. 25, N2, 2000, Spring.

[Gross, M. 2010] Gross, M. 2010. Ignorance Surprise. Science, Society and Ecological Design. MIT.

[Harzing, Anne-Wil] Harzing, Anne-Wil; Web: http://www.harzing.com/index.htm

[Kasperson, R. 1992] Kasperson, R. The Social Amplification of Risk: Progress in Developing an Integrative Framework, In: S. Krimsky and D. Golding (eds) Social Theories of Risk, Praeger, 1992.

[Lyng, 2008] Stephen Lyng, Edgework, Risk, and Uncertainty. In: Zinn, Jens O (ed.) Risk and Uncertainty. An Introduction. Blackwell Publishing, 2008

[Macdonald S., J. Kam, Aardvark et al, 2007] Macdonald S., J. Kam, Aardvark et al.: Quality journals and gamesmanship in management studies. Journal of Information Science 33 (2007), 702-717.

[Monastersky, R., 2005] Monastersky, R., The number that's devouring science. Chronicle of Higher Education 52 (2005). ScienceWatch.com, April 2008, http://sciencewatch.com/inter/aut/2008/08-apr/08aprHe/

[Pinker, S. 1997] St. Pinker, How the Mind Works, Penguin Books, 1997

[RIN, 2010] Peer review, A guide for researchers, Research Information Network, UK, March 2010, http://www.rin.ac.uk/our-work/communicating-and-disseminating-research/peer-review-guideresearchers

[Seglen, P., 1997] Seglen, P.O. Why the impact factor of journals should not be used for evaluating research. BMJ 314 (1997), 498-502.

[Simon, 1957] H. A. Simon, Administrative Behavior. A Study of Decision Making Process in Administrative Organization. The Macmillan Company, New York, 1957

[SRC, 2009] Swedish Research Council, Quality Assessment in Peer Review, 5 November 2009, www.cm.se/webbshop_vr/pdfer/2011_01L.pdf

[STC, 2011] Peer review in scientific publications, Science and Technology Committee, House of Commons, UK, 18 July 2011, http://www.publications.parliament.uk/pa/cm201012/cmselect/cmsctech/856/85602.htm

[Strathern, M.1997] Strathern, M., "'Improving Ratings': Audit in the British University System", European Review 5 (1997), 305-321.

[Wiener, N.1947] N. Wiener 1947, Open letter by N. Wiener published in the Bulletin of the Atomic Scientists, Vol. 3, N1, Jan. 1947. Quoted after Jean-Jacques Salomon, Science et politique, ed. Du Seuil, 1970, p. 308-309.

[Wilbert and Tumin, 1949] E. Wilbert E. & M. Tumin, „Some Social Functions of Ignorance", American Sociological Review, 14 (6); 787-795, 1949, cited by G. Matthias, Ignorance Surprise. Science, Society and Ecological Design. MIT, 2010

Authors' Information

Douhomir Minev – *Prof., chief of department "Public Policies and Social Changes" at the Institute for the Study of Societies and Knowledge, BAS, 3 A "Moskovska" str., Sofia-1000, Bulgaria; e-mail: perspekt@tradel.net*

Major Fields of Scientific Research: Sociology of Knowledge, Economic Sociology, Social Policy