**Draft discussion paper**

# Merit(Peer) Review

## as organizational basis for scientific research

It is probably the main mission of science to determine what exactly distinguishes scientific knowledge from all other alternatives. And though this seems to be easily solved by any journal's editor, things are not exactly like this in reality. There are a number of various "demarcation theories" – from "falsificationism" to "utterances" gaining the status of scientific knowledge.

Nevertheless, such theoretical uncertainty does not necessarily lead to inability to find a practical solution to the problem. Scientific community has long possessed a well-functioning mechanism, which, with all its flaws, can help decide whether aspirations for discoveries have fully established scientific basis. The name of such is peer-review, which manifests itself as "verification of the proposal by experts which work in the same area of expertise"[1]. The very choice of words – peer review – strongly suggests historical reverence to jury trial and jury of peers, which is basically a collegium of equals. In science being equal implies an expert that works in the same area as the researcher whose proposal is under consideration. US National Research Council officially defines "an equal" in peer review perspective as "a person having technical expertise in the subject matter to be reviewed to a degree at least equivalent to that needed for the original work"[2].

[1] Moghissi A., Love B., Straja S. Peer review and scientific assessment. Alexandria: Institute for regulatory science, 2013. P. 8.
[2] In: Peer Review in Environmental Technology Development Programs. Washington D.C.: National Academy Press, 1998.

Peer review practice emerged in scientific journals. This mechanism was first employed by Philosophical Transactions of the Royal Society, a scientific journal published from 1665. Before publications of this kind scientists and researchers presented results of their work in either letters to colleagues or books published on their own. In neither case was it possible to in any way control the content, whereas a scientific journal published under the auspices of scientific communities became a certain beacon of quality and reliability.

In 17-19th centuries this trend became more pronounced, though it was in the first half of the 20th century when with the advent of public and private organizations financing R&D activities this phenomenon gained its full strength. The next step was to officially adopt peer review as the cornerstone of science policy in Germany and the USA. They have set an example for many others – like Japan and Russia – that now base their financial allocations on peer review.

Apart from being a certain credibility measure, peer review also has public significance, which manifests itself in expert scientific results being admitted as proof in courts. It was first recognised in Daubert v. Merrell Dow Pharmaceuticals, 1993, the US Supreme Court case that set the standard for admitting expert testimony in a trial held in court. The parents of two children born with serious birth defects sued Merrell Dow Pharmaceuticals claiming that a drug taken during pregnancy by the mother-to-be caused the birth defects. However, their claim was based on expert documents that had never been published before. On the contrary, Merrell Dow submitted proof showing that no published scientific data demonstrated a link between the drug and birth defects. In the end, the court doubted that it was the drug that caused the children's deformations and ruled out the evidence suggested by the parents as "unfounded and

not proven with the scientific community"[3]. The court's decision was supported by the American Association for the Advancement of Science, which in its letter regarding the case stated that "courts should take into account institutional mechanisms, namely peer review, which have been developed to guarantee that scientists in their work abide by certain scientific criteria"[4].

As a set of publicly acknowledged criteria one could take the outcome of the 2012 Global Summit on Merit Review in the US which gathered almost 50 Heads of Research Councils, mostly from national organizations financing R&D[5]. The participants endorsed a high-level Statement of Principles for Scientific Merit Review along with launching the Global Research Council (GRC). The following merit review principles were released:

## Expert Assessment, Transparency, Impartiality, Appropriateness, Confidentiality, and Integrity and Ethical Considerations.

Since the summit was held at the US initiative it reflected the terminology adopted in the country. Thus, **traditional "peer review" was substituted with "merit review"** – the change that took place in the NSF in 1986 and was connected with the need to take into account not only scientific characteristics of a submitted application, but also other possible goods that it could bring about, including practical use of the results, facilitation of sustainable growth in certain geographical regions and involvement of discriminated groups in R&D. This approach was

[3] U.S, Supreme Court. Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993) URL: http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=us&vol=509&invol=579 Accessed: 17.07.2017

[4] In: Moghissi A., Love B., Straja S. Peer review and scientific assessment. Alexandria: Institute for regulatory science, 2013. P. 78.

[5] See http://www.globalresearchcouncil.org/meetings/2012-meeting

reinforced by the Statement, which covered six main principles of scientific expertise.

First of all, "**expert assessment"**, which implies that reviewers should have appropriate knowledge and expertise to assess an original proposal both in broad context of the research field of expertise to which it contributes and also with regard to its specific objectives and methodology. This principle called for setting clear criteria for selecting such experts. Though this is usually perceived to be logical and self-consistent, the idea presents a number of limitations. Namely, with the adoption of strict criteria, the choice of possible experts is reduced, if not to a minimum, then to the very few. It can be seen in the example of Russian Foundation for Basic Research, which until 2012 had a strict rule to engage only holders of the Russian Doctor of Sciences degree to assess applications. This led to difficulties concerning new fields of science, where there were yet no doctoral degree holders. Similar problems were experienced when using citation index as a criterion for selecting reviewers – as a rule it takes years to increase this figure. It seems that even the most sound criterion - a number of topical publications in reviewed journals – still presents challenges as it requires certain knowledge with the allocator to match thematic fields of an application against articles published by an expert.

Additional difficulties arise when merit review is conducted voluntarily with no fee for the reviewers (a practice widely used in the NSF and Norwegian Research Council). And even though there are many who are willing to do the job only due to the prestige that comes with it, it still takes effort to find appropriate specialists.

Second principle is **"transparency"**, as in decisions should be based on clearly established rules and procedures, which have been published and known in advance. This also means that applicants are

entitled to receive feedback regarding decisions. And even though it is not a problem for the majority of the organizations and foundations, this information can rarely be used by applicants to apply for reassessment. There are few institutions that even have appeal procedures. For instance, NSF received more than 48 thousand applications in 2012 and there were only 46 applicants who applied for reassessment. And only three of them were upheld. In this case being guided by transparency principle doesn't necessarily mean its employment in practice.

Third principle – **"impartiality"**, which implies proposals being assessed fairly and on their merit. Conflicts of interest must be declared and managed according to defined, published procedures. In fact, conflicts of interest do exist in all situations, where a reviewer is interested in any result of the assessment – whether positive or negative. There are four main categories of such interest: financial, personal, organizational and intellectual[5].

Financial interest arises when a reviewer can potentially be a recipient of financial allocations connected to the proposal that he assesses. He should not necessarily be one of the direct recipients, for instance members of his family can work for an organization or a company that have certain aspirations for either of the outcomes.

The most obvious example of personal interest is family relations between an applicant and a reviewer, though this can also be the case of existing friendship between the two.

Organizational interest takes place when either an applicant and a reviewer work for the same organizational structure, or when on the contrary they work for rival organizations.

Intellectual interest covers those cases when a reviewer is an advocate of a specific scientific school, or is accustomed to working with

certain methodology – in other words can't stay neutral to a reviewed proposal.

In all mentioned cases it seems that the only solution is to appoint a well-qualified allocator who will be well aware of reviewers' preferences and allocate proposals with regard to them. But even this cannot guarantee unbiased judgement – as modern science has too many fields of expertise to allow impartial assessment in every one of them.

The fourth principle of merit review is "**appropriateness"**, which suggests that the review process should be consistent with the nature of the call, consistent with the research area addressed, and in proportion to the investment and complexity of the work. In other words, such formula warns against the establishment of a universal official review procedure, which would limit variety among proposals.

Fifth **"confidentiality"** principle states that all proposals, including related data, intellectual property and other documents must be treated in confidence by reviewers and organizations involved in the review process. What level of confidentiality should they expect? First of all peer review identities are to be kept confidential. A proposal under review is not revealed to anyone other than the reviewers and organization involved. It dictates that not only names but critiques of the reviewers will remain confidential indefinitely if a blended peer review model is used.

The nature of the last sixth principle – "**integrity and ethics considerations"** – is not discussed in detail in the Statement, however it is regarded as paramount to the review process. In practice, one can look into US governmental organizations financing science, which, for instance, require proof of compliance with ethical standards when carrying out experiments on people. In fact, this means that responsibility for ethical issues is not taken into account while assessing the proposal –

and reviewers can only formally check submitted documents. In the same way reviewers deal with the “integrity” principle – they don’t have to investigate such transgressions as plagiarism, repetitive publications, false authorship and distortion of data – their mission is to evaluate the proposal according to its scientific significance.

However, ethical issues are not limited to these two principals. For instance, Allan Moghissi, editor-in-chief of “Environment International” gives the example of an article on protection of endangered species, which was assessed as not suitable for publication because reviewers deemed it harmful to the overall mission of wildlife preservation, but did not point out any obvious flaws. Here Moghissi suggests that the final decision on publication should be reserved for the editor, as it is he who is responsible for the achievement of the journal’ goals. Thus his resolve to publish the article despite the recommendations.

There are two main mechanisms of peer/merit review process – individual and collective assessment. The former implies a specific expert giving a written assessment of a proposal, the latter – a group of experts evaluating a proposal at a meeting. In foundations for research both these procedures are widely employed – first individual experts give their comments and conclusions, and then these assessments are discussed during sessions of review panels. There can be differences in their procedures – meetings can either be held with attendance of authors of written assessments, or review panels can only consider the assessments as they have been submitted.

An important thing is anonymity of reviewers – in most cases applicants are not given the names of those assessing their proposals, with the main purpose being to exclude possible negative reactions or potential influence from applicants. This principle is adhered to even when a reviewer and an applicant interact, as this usually happens via

editors or administrators. However, anonymity also has its shortcomings. For instance, reviewers may have a low level of responsibility while assessing proposals. In addition, as reviewers receive no financial benefit for their work, it can be considered as undesirable work load, which can only be mitigated if it comes from an influential institution such as a leading scientific centre, major science foundation or a prestigious journal.

However, even taking into account all the flaws of anonymity, scientific community still favours it. They claim that without it editors will face enormous problems while selecting those who give written reviews, as well it will trigger overall tensions and conflicts.

Moreover, anonymity is seen as one of the crucial factors of peer review, mostly in cases when it is necessary to distinguish between scientific and non-scientific knowledge. Journal of American Medical Association highlighted this when it had to defend secrecy of its reviewers in court. Pharmaceutical company Pfizer, being accused of providing false information regarding one of their drugs, demanded that the journal provide its lawyers with all unpublished correspondence, reviews and articles. The editorial board refused, as it "has always maintained anonymity of reviewers and confidentiality of information". The court sustained this argument, ruling out that "even if the materials contain any sort of proof and evidence, the confidential process of peer review can not be violated".

Peer/merit review does have several inherent flaws, which are often criticized in the scientific community. The first one is conservatism. There is a certain antagonism between peer review process and the necessity to boost revolutionary scientific discoveries. Initially, peer review is more inclined to favour "normal science" elaborated as a regular work of scientists theorizing, observing and experimenting within

a settled paradigm. This becomes an obstacle for “scientific revolutions”, which promote new paradigms and threaten familiar mind-set.

Foundations financing science have their own way of tackling the issue. For example, US NSF has a programme “Early-concept grant for exploratory research”, which allows a program officer to make a decision on the proposal without the help of reviewers providing the proposal contains a new approach or methodology.

In fact, even though one would regard a scientific community as progressive and innovative, it still is conservative and traditional. Suggesting that even though decisions on financial allocations are highly decentralized, some authors claim that support of advanced projects becomes possible only in case they sort well with government’s strategic goals. This stance is proved by examples of Apollo programme initiated by the Kennedy administration, and Carter’s Energy Research programme aimed at overcoming 1970s energy crisis. However, in most cases conferences, work groups and lobbying, as well as adopted laws – are collateral side-effects on the path of struggle for power and money among various political actors. And there is acute need for real political leadership, if one would want to make a transition to a real “revolution in science”[5].

Another problem is the closed and elitist nature of peer/merit review process, with just a few established reviewers in each area of science. This was once strongly criticised by Washington Post, which speculated that “merit review is designed to further promote rich and well-known organizations, while smaller universities are left behind”. The situation corresponds with Merton’s “Matthew effect”, which was

[5] Sarewitz D. Does Science Policy Exist, and If So, Does it Matter?: Some Observations on the U.S. R&D Budget. URL: http://archive.cspo.org/documents/budget_seminar.pdf Accessed:

coined to describe how eminent scientists will often get more credit than a comparatively unknown researcher, even if their work is similar[6].

Nevertheless, peer/merit review, although it does have flaws, is difficult to substitute. The sole alternative can be judgment based on a researcher's reputation, which will spare applicants from writing lengthy proposals, while giving them the opportunity to submit their CVs and research plans instead.

Scientific journals also find alternative ways to substitute peer reviewing in their work. Thus, in 2006 Nature initiated a programme that enabled researchers to openly publish their articles in order to receive additional reviews from their colleagues. However, only 5% of the authors chose to resort to this option.

Such experimental novelties not only contribute to the development of new mechanisms of reviewing, but also strengthen the existing peer/merit review procedure. Generally, all problems and difficulties with the method can be dealt with by widening the circle of reviewers. It will entail, however, financial issues, such as an increased amount of money spent and as a result – an increased cost of peer review.

[6] Merton R. The Sociology of Science. Chicago: The University of Chicago Press, 1973. P. 439-459.