

## ***SCIENTIFIC PEER REVIEW IN THE PUBLIC SECTOR***

Mohammed Kashef<sup>1</sup>

### **I. INTRODUCTION**

Peer review is a mechanism for “evaluating scientific work which is used by scientists to certify the correctness of procedures, establish the plausibility of results, and allocate resources.”<sup>2</sup> Peer review is a process that is carried out by experts in a particular area of science who can evaluate scientific and technical quality of what is reviewed.<sup>3</sup> It is considered a critical quality control principle in the planning, design, conduct and interpretation of scientific research. Through peer review, researchers allow other experts to examine, criticize and improve their work.<sup>4</sup> Thereby improving the quality of science and innovation while maximizing the efficient use of the scarce resource of time.

Peer review is a common practice in the scientific community and, as this memo explains, in widespread use in the public sector as well. It is an integral practice to the development of quality research in the private and public sectors, in industry and in education because the process of peer review allows even a large group of scientists, regardless of geographic proximity, to collaborate on the evaluation of innovation.

This primer on peer review in the public sector provides a brief introduction to the use of peer review in government. It is designed to demonstrate that peer review of patents is not only possible but represents a conservative effort at reform based on existing and well-established practices. This primer discusses in detail the peer review practices of three government agencies to illustrate how peer review functions. It provides ideas for how to translate peer review for the patent process and to the Internet.

### **II. SCIENTIFIC PEER REVIEW AT THREE FEDERAL AGENCIES**

This section discusses the peer review process at three federal agencies. Each uses peer review to grant and award funding for research based on scientific and technological merits. Fundamentally sound, these peer review processes allow the agency to make better decisions with the benefit of informed participation. They increase the legitimacy and quality of that decision-making.

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<sup>1</sup> Mohammed Kashef, New York Law School, ‘2L (evening) B.S., Electrical Engineering; State University of New York; Information System Analyst, Prudential Financial.

<sup>2</sup> Darryl J. Chubin, Edward J. Hackett, *Peerless Science: Peer Review and U.S. Science Policy* 2 (1990).

<sup>3</sup> H.R. Science Comm., *Research Priorities for the Reauthorization of the Transportation Equity Act for the 21<sup>st</sup> Century*, (Apr. 10, 2003).

<sup>4</sup> *Peer Review Essential for Scientific Advances*, [http://deploymentlink.osd.mil/news/sep01/news090401\\_001.shtml](http://deploymentlink.osd.mil/news/sep01/news090401_001.shtml) (Sept. 1, 2001).

## A. The National Science Foundation

The National Science Foundation is a federal agency created to “promote the progress of science, to advance the national health, prosperity, and welfare, and to secure the national defense.”<sup>5</sup>

The NSF supports its goals through grants and contracts in scientific and engineering research programs and awards graduate fellowships in the sciences and in engineering. The NSF fosters the interchange of scientific information among scientists and engineers and the development and use of computers and other scientific methods and technologies for research and education in the sciences. The NSF evaluates the status and needs of various sciences and engineering disciplines and provides a central clearinghouse for the collection, interpretation, and analysis of scientific\technical data and resources. NSF determines the total amount of federal money received by universities and organizations that get scientific and engineering research grants.

- NSF uses peer review to administer grants in scientific research programs
- NSF receives more than 40,000 proposals each year that are evaluated by approximately 58,000 outside reviewers
- Proposals are evaluated by independent reviewers or panels of reviewers, including scientists, engineers, and educators
- Reviewers determine technical soundness, available resources, and assess potential impacts and benefits
- Program Officers identify potential reviewers through databases that are arranged by areas of expertise
- The Agency prescribes detailed conflict of interest regulations

The NSF provides funding to support science and engineering research and education in the following disciplines: biological sciences, computer and information science and engineering, engineering, geosciences, mathematics and physical sciences, social, behavioral and economic sciences, education and human resources.<sup>6</sup>

Unlike many other federal agencies, the NSF does not hire researchers or directly operate its own laboratories and facilities. Instead, the NSF supports scientists, engineers and educators directly through their own institutions by funding their facilities and equipment.<sup>7</sup>

NSF keeps close track of research around the United States and the world, maintaining contact with the research community to identify areas that are most likely to result in progress and choosing the most promising people to conduct the research.

Recipients of awards are chosen from those who send proposals asking for a specific amount of support for a specific project. The process begins with workshops and conferences to discuss the progress of science and engineering and what the United States needs to accomplish in each field. Then the NSF publishes a notice about a funding, which it invites researchers to submit

<sup>5</sup> *About The National Science Foundation*, <http://www.nsf.gov/about> (last updated Feb. 11, 2005).

<sup>6</sup> *About Funding*, <http://www.nsf.gov/funding/aboutfunding.jsp> (last updated Jan. 29, 2005).

<sup>7</sup> *What We Do*, <http://www.nsf.gov/about/what.jsp> (last updated Mar. 22, 2005).

proposals describing their ideas on how to meet a particular need. At present, NSF receives more than 40,000 proposals per year.<sup>8</sup>

The NSF uses peer review to administer grants in scientific research programs for the purpose of strengthening scientific and engineering research potential, and education programs.<sup>9</sup> By using peer review the NSF fosters the interchange of scientific information among scientists and engineers in the United States and foreign countries. The NSF provides a central clearinghouse for the collection, interpretation and analysis of data on scientific and technical resources. NSF determines the total amount of federal money received by universities and appropriate organizations to conduct scientific and engineering research.

The proposals are evaluated by a panel of independent reviewers consisting of scientists, engineers, and educators, who do not work at NSF or for the institution that employs the proposing researchers.<sup>10</sup> The agency selects the reviewers from among the national pool of experts in each field. Each year NSF receives Of the 40,000 new proposals and subjects received each year by the NSF virtually all of them to an external merit review. In 2004, approximately 58,000 outside experts provided over 250,000 separate evaluation of proposals submitted to the NSF.<sup>11</sup>

Review panels examine research performance competence to determine the capability of the researcher according to established review criteria. Reviewers determine the technical soundness of the proposed approach and the resources available. Intrinsic merit review of the research examines the technical merit and creativity of a proposal to assess its educational impact and potential benefits to society.<sup>12</sup> The relevance of the research is also reviewed which is the likelihood that the research can contribute to the achievement of a goal, and how the research can improve the quality of scientific and engineering research and education, and manpower.

The role of peer review varies from program to program within the agency. The NSF has a Program Officer that undertakes a preliminary assessment of a proposal's subject matter and attempts to identify a group of qualified peer reviewers with expertise in the subject matter.<sup>13</sup> Program Officers identify reviewers through lists of potential reviewers arranged by areas of expertise that is maintained by the agency's staff<sup>14</sup> To compile this list the NSF obtains the names of the reviewers through recent publications in science and engineering journals, presentations at professional meetings, reviewer recommendations, bibliographic and citation databases, and proposal author's suggestions.<sup>15</sup> Program officers select reviewers on the basis of their expertise, objectivity, open-mindedness, and in the case of reviewers who may be assigned to panels their ability to work with others.<sup>16</sup>

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<sup>8</sup> *How We Work*, <http://www.nsf.gov/about/how/jsp> (last updated Jul. 15, 2005).

<sup>9</sup> *National Science Foundation Strategic Plan FY 2003-2008*, NSF (Sept. 30, 2003).

<sup>10</sup> *Chapter III – NSF Proposal Processing and Review*, [http://nsf.gov/pubs/gpg/nasf04\\_23/3.jsp](http://nsf.gov/pubs/gpg/nasf04_23/3.jsp) (last updated Feb. 9, 2005).

<sup>11</sup> H.R. Comm. 05-119 at 1 (Sept. 30, 2005).

<sup>12</sup> Memo. From Rita R. Colwell, Dir., National Science Foundation, to employees, (Sept. 20, 1999).

<sup>13</sup> *Id.* at 3.

<sup>14</sup> Thomas O. McGarity, *Peer Review In Awarding Federal Grants in the Arts and Sciences*, 9 Berkeley Tech. L.J. 16 (1994).

<sup>15</sup> H.R. Comm. 05-119 at 21 (Sept. 30, 2005).

<sup>16</sup> Thomas O. McGarity, *Peer Review In Awarding Federal Grants in the Arts and Sciences*, 9 Berkeley Tech. L.J. 16 (1994).

Reviewers are asked to provide a written critique of an application and give a rating based on the identified criteria. Since each reviewer receives only one of the applications in a given pool, the reviewer has no opportunity to compare it with competing applications. Usually about five or six of the ten proposed reviewers respond to the request. About one-third of the applications also undergo a panel review. Some programs such as biology, rely quite heavily upon panels, whereas others such as physical sciences use panels only for complicated and expensive proposals. In a panel review, the experts of about eight to fifteen individuals read the mail reviews and attempt to evaluate all proposals in a given pool.

Some applicants may be chosen for site visits. All applicants must provide updates of their proposals to identify any changes that may have occurred since their original proposals were submitted. Site visits are conducted by teams consisting of one or two members of the peer review panel that reviewed the original proposals, one or two staff members, one member of the fifteen member external review committee, and several other scientists with expertise in the relevant area.<sup>17</sup> The site-visit team first reviews all of the information on file about the proposal, including the institution's response to any questions posed by the external peer review committee. After meeting with officials and researchers at the applicant's institution, the site-visit team prepares a report discussing the strengths and weaknesses of the proposal with respect to the quality of the researchers, depth of institutional support, and overall educational climate at the institution.<sup>18</sup> The site-visit team must answer questions posed by the external peer review committee and identify the strengths and weaknesses of the application, but it is not supposed to recommend whether the proposal should or should not be funded. They request that the reports be as objective as possible to avoid influence.

The external peer review committee, which is twenty-five members provides additional expertise, and reviews the site visit reports. Each panel member receives an abstract, executive summary, budget and the reviews of each of the thirty proposals, but subcommittees of three reviewers provide intensive analysis of individual proposals.<sup>19</sup> Each member is assigned to one of two groups that evaluate all of the proposals, which is to ensure that no committee member participates in an application from his or her own institution. The staff ensures that the first group to consider a proposal does not contain a representative from the institution that submitted it. All members must excuse themselves from any meeting in which the panel is evaluating proposals from their own institutions. Each group must rank all of the proposals and choose the top seven to ten. The second group reviews the work of the previous group to determine whether it agrees with the rankings. Then the committee attempts to arrive at a consensus on proposals that deserve funding. The Director of the Science and Technology Center Directorate then recommends ten to fifteen from among those proposals for presentation to the National Science Board.

After the individual and/or panel reviews have been completed, the Program Officer evaluates and ranks the proposals on a five point scale ranging from "excellent" to "poor" in assessing

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<sup>16</sup> Thomas O. McGarity, *Peer Review In Awarding Federal Grants in the Arts and Sciences*, 9 Berkeley Tech. L.J. 18 (1994).

<sup>18</sup> *Id.*

quality of the intellectual merit and the broader impacts of the activities<sup>20</sup>. To address intellectual merit and research quality reviewers consider interdisciplinary attributes, innovation, design, organization of the project, access to resources, the broader impacts of the research in education, infrastructure, diversity, scientific literacy, and societal needs.<sup>21</sup> The Program Officer provides an explanation for any deviations from the panel's recommendations. Program Officers are given the discretion to make a decision that is based on the panel recommendations and funding decisions. Program Officer's decisions are in turn reviewed by section heads and in some cases by the head of the Directorate, whose considerations include long-term political concerns, technological innovation, potential for practical application in the private sector, geographical equity in the distribution of funds, and overall scientific merit.<sup>22</sup> The entire process normally takes about five to nine months for individual research grants and about ten to twelve months for major institutional grants. Reviews and recommendations for very large awards receive additional review at a higher-level by the Director's Review Board and the National Science Board.<sup>23</sup>

At this point, the agency informs all applicants of the results of the process. Applicants receive copies of all mail reviews and of the relevant summaries of the panel meetings. The panel summaries are intended to give the applicants some idea of how their proposals fared in relation to others considered by the panel and is usually drafted by the panel member who presented the proposal to the panel.

The agency has prescribed detailed conflict of interest regulations for persons employed by NSF, including members of the NSB. These regulations prevent present and past employees from representing anyone dealing with any federal official in any matter in which they were involved at the NSF.<sup>24</sup> NSF employees' are prohibited from any personal involvement in the handling of any application which the employee, a member of the employee's immediate family, or an organization of which the employee is a part or may become a part of a conflict interest.<sup>25</sup> NSF's regulations prohibit employees who have access to information not generally available to the public from using that information for their private benefit or for the private benefit of others. A member of the NSB may not participate in deliberations that would affect the member's own interests, those of a close relative, or those of an institution with which the member has any of affiliation. Separate regulations apply to outside peer reviewers, each of which must reveal any possible conflicts of interest that they may have.<sup>26</sup> The regulations define potentially biasing affiliation or relationships that include employment affiliations, family relationships, and personal friendships. Panelists must disclose all such potentially biasing affiliations or relationships to the Program Officers.

Acknowledging that the peer review system must be kept confidential from grant applicants to ensure frank and candid opinions and those peer reviewers who offer evaluations must therefore

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<sup>18</sup> H.R. Comm. 05-119 at 1 (Sept. 30, 2005).

<sup>19</sup> *Id.* at 4.

<sup>21</sup> *Id.* at 5.

<sup>22</sup> *Id.* at 8.

<sup>23</sup> *Id.* at 21

<sup>24</sup> Thomas O. McGarity, *Peer Review In Awarding Federal Grants in the Arts and Sciences*, 9 Berkeley Tech. L.J. 18-19 (1994).

<sup>25</sup> *Id.* at 19.

<sup>26</sup> *Id.*

remain anonymous, the petition maintained that NSF had gone far beyond what was reasonably necessary to ensure the confidentiality of the review process.

The agency touts its peer review system as one of the most thorough and complex peer review systems in the world. The redundant layers of peer review are justified because of the large sums of money at stake.

## B. The Environmental Protection Agency

The Environmental Protection Agency is a federal agency that works to develop and enforce regulations that implement environmental laws enacted by Congress. EPA is primarily responsible for the researching and setting of national standards for environmental programs. The EPA delegates responsibilities to the States for issuing permits, monitoring and enforcing compliance of its environmental laws.<sup>27</sup>

EPA issues grants and works with over 10,000 different parties including individual states and local governments, non-profit organizations, and educational institutions that support research that will improve the scientific basis for decisions on environmental issues that help the EPA achieve its goals. EPA support includes research grants and graduate fellowships whose scientific partners include: other nations, private organizations, educational institutions, and other agencies.<sup>28</sup> The EPA supports environmental education projects that enhance the public's awareness, knowledge, and skills to make informed decisions that affect environmental quality. The Agency also offers information for state and local governments and small businesses on financing environmental services and projects. Those projects include pollution prevention programs and energy conservations efforts.

The Agency has laboratories throughout the nation that work with its scientific partners to assess environmental conditions, and to identify and solve current and future environmental problems.<sup>29</sup>

The Agency integrates the work of its scientific partners and provides leadership in addressing

- EPA issues grants and graduate fellowships to over 10,000 different parties
- The Agency funds approximately 40 million per year to research grants
- The Agency relies on six science review panels that administer programs
- Each panel consists of 20 – 60 reviewers
- Each panel submits a recommendation on each proposal and reasons for that recommendation based on established criteria from the Agency
- The Agency has an established appeals process for rejected applications

environmental issues and in advancing scientific and technology risk assessment management. The Agency's partners set pollution management goals.

Most external EPA-funded research is administered through the agency's Office of Research and Development (ORD) which funds approximately \$40 million per year in research grants. The grant selection process at the EPA

<sup>27</sup> *About EPA*, <http://www.epa.gov/epahome/aboutepa.htm> (last updated Aug. 24, 2005).

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

consists of a system of review that relies upon six science review panels that administer the program in six principal areas.<sup>30</sup> The agency enters into a cooperative agreement with each panel chairperson, who is an outside scientist or engineer appointed to a single three-year term by the ORD, to supervise the peer review process.<sup>31</sup> The chairperson is responsible for selecting the members of the Panel, overseeing the Panel's scientific review of the applications assigned to it, and providing EPA staff with a Summary Statement of the Panel's recommendations for each application. With the approval of the EPA staff, the chairperson chooses twenty to sixty members for the Panel from among recognized experts in the relevant field.<sup>32</sup> An EPA employee called a "Science Review Administrator" provides policy and procedural guidance and managerial assistance.

After applications are referred to the EPA they are then reviewed for legal and administrative acceptability. They then go to the Research Grants Program for assignment to the appropriate peer review panel. The Panel Chairperson reviews them with the assistance of the SRA and assigns each application to panel members who serve as primary reviewers of that application. Each primary reviewer measures the applications against the listed criteria and prepares an evaluation with an accompanying recommendation to approve, disapprove, or defer the proposal.

The Panel's evaluation of each application begins with a review of the written evaluations and recommendations prepared by the three primary reviewers. Then a full Panel discussion addresses each proposal's strengths and weaknesses. At the end the discussion, each panelist records a numerical priority score ranging from 0 to 100 reflecting the application's scientific merit. The Panel may not recommend for funding any proposal with an average score of less than sixty, and all proposals with an average score of greater than sixty receive an automatic recommendation.<sup>33</sup> The Chairman, with the assistance of the SRA, prepares a summary statement setting out the Panel's recommendation and supporting reasons. EPA staff gives the highest consideration to the top applications from each Panel.

Panelists are expected to keep all information in confidence, and the EPA's procedures do not allow for direct communication between members of the panel and applicants. Panel members are bound by the confidentiality of all parts of the proposals. The EPA as a matter of policy does not disclose the names of primary reviewers to anyone.

All applicants who failed the review receive a rejection letter and all those whose pass the technical review receive a letter of acceptance that state that their applications are under further consideration by EPA staff. About a month later every applicant receives the Chairman's summary of the Panel's review of his or her application. The agency later allows applicants to see all documents that were created during the review process.

EPA's conflict of interest requirements provide that no panelist may attend a panel meeting in which the panel evaluates his or her own grant application or the application of a close relative, friend or close professional associate.<sup>34</sup> A panelist may attend a meeting at which an application

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<sup>30</sup> Thomas O. McGarity, *Peer Review In Awarding Federal Grants in the Arts and Sciences*, 9 Berkeley Tech. L.J. 27 (1994).

<sup>31</sup> *Id.*

<sup>32</sup> *Id.*

<sup>33</sup> *Id.* at 28.

<sup>34</sup> *Id.*

from his or her institution will be considered, but can not participate during the consideration of that application.

EPA has established appeal procedures for rejected applicants. Each Project Officer designates a dispute official from among senior EPA employees who are knowledgeable about the EPA's assistance programs to review and resolve disputes over application rejections. The disputes official then issues a written decision and if unfavorable the applicant may take an appeal an EPA Administrator. The Administrator's decision constitutes a final decision by the agency. The only further action by an application is a re-submittal that will usually be considered by the same panel.

### C. The National Institute of Health

The National Institutes of Health (NIH), is part of the US Department of Health and Human Services and is the primary federal agency charged with conducting and supporting medical research.<sup>35</sup> The NIH is composed of 27 Institutes and Centers and provides leadership and financial support each of those institutes and centers. The NIH manages the medical research for the Nation.

- Peer review study groups are composed of scientists from outside the NIH
- The Peer review groups evaluate the scientific and technical merit of proposed research
- Criteria for selecting reviewers are based on expertise, diversity, and dedication to objective reviews
- Each study group consists of approximately 20 scientists
- Combined expertise in a study group is intended to span the depth and diversity of the science it covers
- Each group will provide a critique, summary of finding, recommendation, and notes of special consideration
- Approximately every 6 weeks 16,000 applications are submitted to the agency

The agency's goals consist of the development of discoveries and innovative research strategies to advance the Nation's capacity to protect and improve health. The NIH develops and maintains scientific resources related to disease prevention and expands the knowledge base in medical and associated sciences.

Through the NIH's 27 institutes and centers the agency provides leadership and financial support to their researchers. Each Institute determines how to allocate its own funds among many different activities of science. The decision makers at the NIH when setting research priorities seek advice from the scientific community including individual researchers and professional societies, patient organizations and voluntary health associations, advisory councils, congress and current presidential administration, and the NIH staff.<sup>36</sup>

Peer review groups composed of scientists from outside the NIH evaluate investigator-initiated applications for NIH funding.<sup>37</sup> The peer review groups evaluate scientific and technical merit of the proposed research. These evaluations are used by the individual Institutes to determine which

<sup>35</sup> *About NIH*, <http://www.nih.gov/about> (last updated Sept. 16, 2005).

<sup>36</sup> *NIH Research Planning*, <http://nih.gov/about/researchplanning.htm> (last updated Apr. 27, 2005)

<sup>37</sup> *Id.*

projects to fund. The Office of Extramural Research (OER) manages the development and implementation of policies and procedures that pertain to peer review conducted at the NIH.<sup>38</sup>

The Peer Review Advisory Committee (PRAC) was established in 2005 to provide technical and scientific advice and recommendations to the NIH on all procedures and policies related to the process of peer review by which the scientific and technical merit of NIH grant applications is assessed.<sup>39</sup> The PRAC is involved in all matters concerning the policy, practice, coordination, and evaluation of peer review at the NIH. This includes peer review at the CSR as well as peer review in the NIH Institutes and Centers.

Criteria for selecting reviewers is based on "recognized authority in the researchers field, diversity with respect to the geographic distribution, gender, race and ethnicity of the membership, and dedication to high quality and fair reviews."<sup>40</sup> Reviewers are required to be knowledgeable of emerging areas of science. The nature and types of grants being play a role in the selection of review members. Fairness and objectivity is required by each reviewer.

Peer review of applications submitted to the NIH takes place in multiple steps. The initial step of the peer review process takes place in Scientific Review Groups (SRGs) that are managed by Scientific Review Administrators (SRAs) who are located in the Institutes and Centers of the NIH.<sup>41</sup> Applications for grants and support from the NIH are initially by the SRGs who are composed of scientists from the extramural research community. The objective of the initial peer review is to evaluate and rate the scientific and technical merit of the proposed research or research training.

The second level of peer review is carried out by the NIH advisory councils.<sup>42</sup> These Councils are composed of scientists from the extramural research community and public representatives. These councils ensure that the NIH receives advice from a cross-section of the US population in the process of its deliberation and decisions.

The Center for Scientific Review (CSR) receives all NIH grant applications. Most investigator-initiated applications for NIH funds are referred to CSR review groups. The NIH Institutes and Centers (ICs) coordinate the review of many IC-specific applications and use the same peer review process described below.

One or more CSR Referral Officers examines an application and determines the most appropriate Integrated Review Group (IRG) to assess it for scientific merit.<sup>43</sup> The application is then assigned to one of the IRG's study sections. A study section typically includes 20 or more scientists from the community of productive researchers. Applications will also be assigned to the NIH IC best suited to fund the application should it have sufficient merit.

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<sup>38</sup> *Id.*

<sup>39</sup> *Peer Review Advisory Committee*, <http://grants.nih.gov/grants/peer/prac/index.htm>

<sup>40</sup> *How Scientists are Selected for Study Section Service*,

<http://cms.csr.nih.gov/PeerReviewMeetings/BestPractices/How+Scientists+Are+Selected+For+Study+Selection+Service.htm> (Aug. 4, 2005).

<sup>41</sup> *OER: Peer Review Policy and Issues*, <http://grants.nih.gov/grants/peer/peer.htm>

<sup>42</sup> *Id.*

<sup>43</sup> *Overview of Peer Review Process*,

<http://cms.csr.nih.gov/ResourcesforApplicants/PolicyProcedureReview+Guidelines/OverviewofPeerReviewProcess/> (last updated Nov. 3, 2005)

The combined expertise of the scientists in a study section is intended to span the depth and diversity of the science it covers. CSR may recruit temporary reviewers or secure mail reviews from outside consultants. Special Emphasis Panels also may be formed on a need basis to review applications when special expertise is required or when special circumstances arise.

An applicant's SRA will analyze the content of an application, check for completeness, and decide which study section members can best review it or act as discussants.<sup>44</sup> Unless a conflict of interest exists, all study section members receive copies of an application approximately 6 weeks before their meeting. Typically, two or three members are asked to provide written reviews of each application, and one or two additional members serve as discussants.

Before the study section meets, members list all applications believed to be in the lower half for scientific merit. If all members agree, these applications are "streamlined," and they will not be discussed at the meeting, but the assigned reviewers will still provide written critiques. One member serves as chair and conducts the meeting with the SRA. After a general discussion, members mark their priority scores privately which are later tabulated by CSR.

Within a few days after the meeting a letter with the priority score and percentile ranking is automatically to the applicant. In about 6 weeks, the applicant's summary statement will be delivered to the assigned IC, which will send the applicant a copy. It will include (1) the written critiques produced by the assigned reviewers, (2) the SRA's summary of the study section's discussion, (3) study section recommendations, and (4) administrative notes of special consideration.<sup>45</sup>

After a decision is reached on an application the CSR will send notices to the applicant and sponsored research office. Applicants may question either their study section or the IC assignment by contacting the Scientific Review Administrator (SRA). It usually takes 6 weeks to refer the 16,000 applications submitted each round.

#### **D. Conclusion**

In short, peer review is in widespread use in the public sector. Each agency has an established process for selecting experts, managing their communication, divvying up work and making policy determinations with the benefit of this community input. From these diverse practices, we can establish a list of initial questions to be answered if a new peer review – community patent reform – process is to be established:

- Does the work require a peer review?
  - Identification that the work to be reviewed is scientific and/or technical in nature. Major works that include establishments of significant models and mythologies, focuses on significant emerging issues, has significant implications, involves significant investment, and is novel.
- What are the costs of conducting such a review? Can sources of funding be ensured?
- What the time frame for peer review, including deadlines for completion and availability of reviewers?

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<sup>44</sup> *Id.*

<sup>45</sup> *Id.*

- What will be the review criteria?
- Who will determine the key issues to review?
- What will be the mechanism for review?
  - Internal
  - External
  - Mail
  - Face to face meetings
  - Internet
- How will reviewers be identified? And rated?
  - Expertise of reviewer
  - Quality of participation
  - Conflict of interest considerations
- What informational inputs are needed for the peer review process?
- What outputs will reviewers produce?
- What incentives will there be for reviewer participation?
- Are there legal considerations or ramifications to adopting peer review?