Peer Review and e-Infrastructures
Practical Examples

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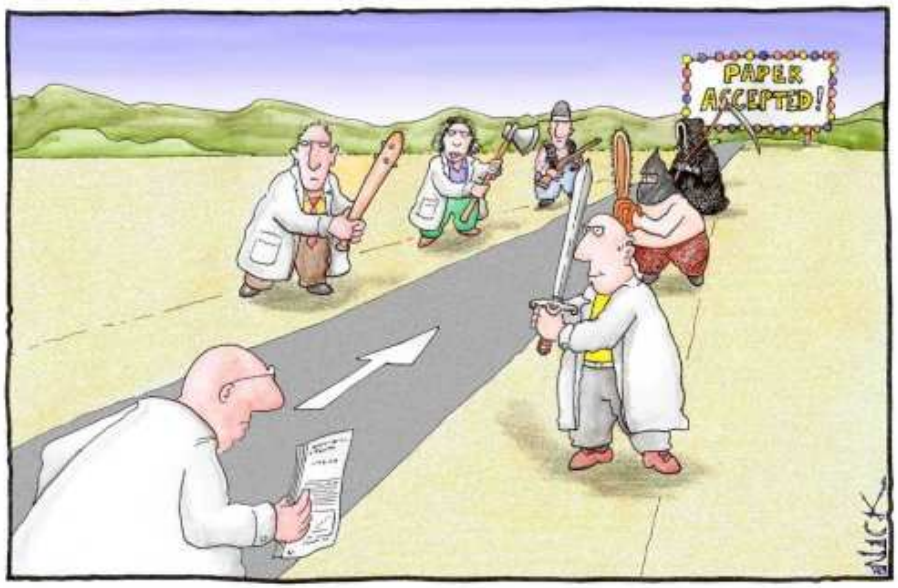
Peer review

Peer review (or **refereeing**) is the process of subjecting scholarly work, a research proposal, or other activity to the scrutiny of others who are experts in the same field.

Peer review requires a community of experts in a given (often narrow) field, who are qualified and able to do an impartial review.

In practice, peer review refers to the work done during the screening of submitted manuscripts and funding applications.



Most scientists regarded the new streamlined peer-review process as 'quite an improvement.'

Peer review

Peer review is used in modern science only since the middle of the 20th century, except for medicine.

In earlier days, established authors and editors were given more latitude in their journalistic discretion. “In journals in those days, the burden of proof was generally on the opponents rather than the proponents of new ideas.” *(Nature)*

Einstein's "Annus Mirabilis" papers (1905) in *Annalen der Physik* were peer-reviewed only by the journal's editor-in-chief.

Justification

A peer review process encourages authors to meet accepted standards of their discipline and prevents the dissemination of irrelevant findings, unwarranted claims, unacceptable interpretations, and personal views.

Publications in scientific journals that have not undergone peer review are likely to be regarded with suspicion by scholars and professionals.

Styles of review

Peer review can be *rigorous*, in terms of the process, without being highly *stringent*.

When the available capacity is limited, peer review is often used to select a small number of proposals or manuscripts.

A call for proposals/papers may have little response, in which case there may be little incentive for selection.

Often the criteria and decisions of what is "good enough" falls to the organizer of the review.

Styles of review

Journals such as *Science* and *Nature* have stringent standards for publication, and reject papers that report good quality scientific work if editors feel the work is not a breakthrough in the field.

Such journals generally have a two-phase review process:

- First, members of the editorial board verify that the paper's findings — if correct — would be ground-breaking enough to warrant publication. Most papers are rejected at this stage.

- Papers that do pass this 'pre-reviewing' are sent out for in-depth review to outside referees.

Styles of review

Scientific journals use peer review primarily to filter out mistakes and incompetence, plagiarism and straightforward application of known methods.

To preserve the integrity of the peer-review process, submitting authors may not be informed of who reviews, sometimes not even who is the associate editor.

In many cases, alternatively called "masked" or "double-masked" review, the identity of the authors is concealed from the reviewers, to avoid that the knowledge of authorship bias the review.

Styles of review

An alternative to masked review, is to encourage authors and reviewers to declare their conflicts of interest when the names of authors (and sometimes reviewers) are known to the other.

When conflicts are reported, the conflicting reviewer is prohibited from reviewing and discussing the manuscript.

The incentive for reviewers to declare their conflicts of interest is a matter of professional ethics, individual integrity and trust. Reviews are a matter of record and the reviewer's credibility depends upon how they represent themselves among their peers.

Styles of review

A rigorous standard of accountability is known as an audit.

Most journals and grant agencies have a policy that authors must archive their data and methods in the event another researcher wishes to replicate or audit the research after publication.

Because reviewers are not paid, they cannot be expected to put as much time and effort into a review as an audit requires.

In addition, archiving policies are often ignored by researchers.

Here, we primarily focus on peer-review to allocate resources in infrastructure (access) rather than verifying scientific results resulting from the use of this infrastructure.

Reviewers

The decision whether or not to fund a research proposal rests with an official body, e.g., funding agency or 'owners' of the infrastructure. They usually defer the scientific evaluation to an independent body that uses the opinion of a group of *reviewers* in making their decision:

- Spread workload.
- Diversity of opinion.
- A single reviewer cannot be expected to be sufficiently expert in all areas covered by a horizontal infrastructure.

Since reviewers are normally selected from experts in the fields discussed, the process of peer review is considered critical to establishing a reliable body of research and knowledge.

A difficulty that peer review organizers face is that there may be few scholars who truly qualify as both anonymous and experts.

Reviewers

Reviewers are typically *anonymous* and *independent*, to help foster unvarnished criticism, and to discourage *cronyism* in funding and publication decisions.

However, guidelines governing peer review may require that reviewer's identity be disclosed under some circumstances.

Anonymity may be unilateral or reciprocal (single- or double-blinded). Evaluation may be perceived as more biased in the former case.

Criticism

Although generally considered essential to academic quality, peer review has been criticized as ineffective and misunderstood.

A common complaint among researchers is that the peer review process is slow. It can take months (even years) to get something published/approved.

"The mistake, of course, is to have thought that peer review was any more than a crude means of discovering the acceptability — not the validity — of a new finding. Editors and scientists alike insist on the pivotal importance of peer review. We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller. But we know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong." Richard Horton, editor of the British medical journal The Lancet.

Open peer review

Impartial review, especially of work in less narrowly defined or inter-disciplinary fields, may be difficult to accomplish.

It has been suggested that traditional anonymous peer review lacks accountability, can lead to abuse by reviewers, and may be biased and inconsistent.

Peer review with various degrees of "openness" have been suggested, where reviewers and readers enter into some form of dialogue with the authors.

Starting in the 1990s, several scientific journals started experiments with hybrid processes, allowing open peer reviews in parallel to the traditional model. Throughout the 2000s, academic journals using open peer review were launched.

Evaluation

Reviewers' evaluations usually include an explicit recommendation of what to do with the proposal, often chosen from options provided. Most recommendations are along the following lines:

- to (unconditionally) accept the proposal
- to accept it, provided authors improve it in certain ways
- to reject it, but encourage revision and resubmission
- to (unconditionally) reject the proposal

In situations where reviewers disagree substantially, there must be a process to reach a decision.

The role of reviewers is advisory. The organizer of the review is typically under no formal obligation to accept opinions of reviewers.

Peer review for infrastructure

Guiding principles for peer-review in research infrastructure are the **scientific quality** of the proposed activity, the **proven need** to use the infrastructure and the **feasibility** to use the infrastructure.

Aim is to maximise impact of major investments in infrastructure; expensive infrastructure must be used by projects with the highest potential. It is required that the subject is both novel and substantial.

Aim is also to spot mistakes or flaws in a complicated piece of work. Exposing work to others increases the chance that weaknesses are identified (and possibly improved) before access is granted.

In new and eclectic subjects, opportunities for improvement may be more obvious to someone with special expertise or to 'a fresh eye'.

Access to HPC infrastructure

In many European countries, peer review to determine access to national HPC resources has the following properties:

- Technical and scientific assessments are the norm;

- Scientific excellence is the main assessment criterion;

- Different types of allocation are common (mainly defined by size of request) with different levels of peer review;

- Several countries use panels to review and prioritise proposals;

- It is common to separate the allocation of resources from the peer review and prioritisation recommendations.

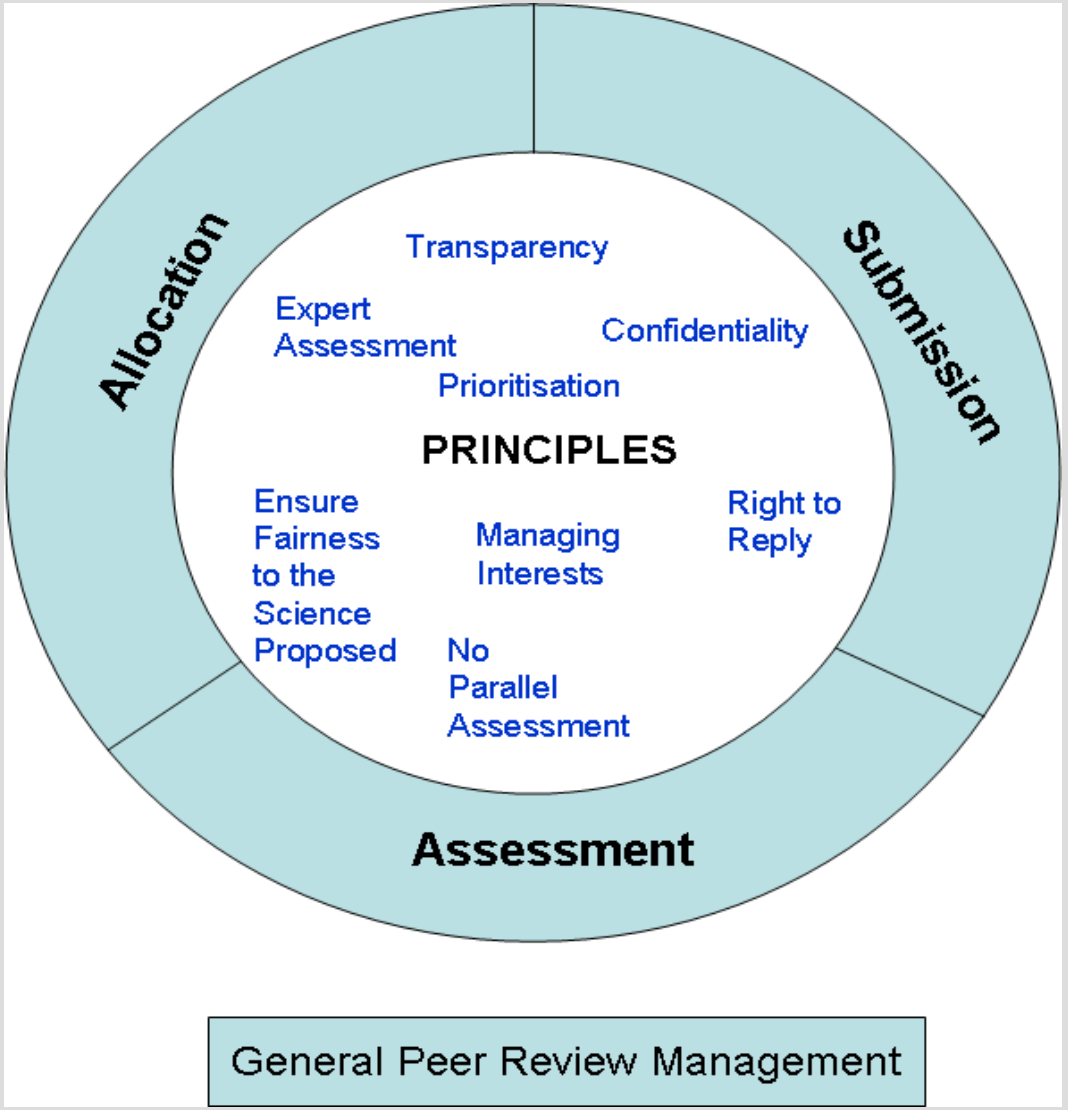
Steps and Principal values

Main steps:

1. Application/ Submission

2. Assessment:
   - Technical
   - Scientific

3. Allocation
   - Prioritization



PRACE

PRACE: principal values

Transparency

Ensure that the peer review process is open and clear to all stakeholders, from funding agencies to end users. This means that the goals and criteria for usage of the infrastructure must be well defined and published before proposal submission.

Applicants “know before they go”, i.e., they know what to expect.

PRACE: principal values

Ensure Fairness to the Science Proposed

Peer review must be fair to the science, rather than to an individual applicant, institution or country. Support the best science based on merit and impact regardless of where it comes from.

Fairness does not mean that every country gets a rigid "fair share" of access on the basis of investment or other non-scientific criteria.

However, funding and usage models may lead to a partitioning of the available resources per 'owner', each of which can carry out a peer-review process on its own share of the resource. Also strategic science roadmaps may priortize access to resources.

PRACE: principal values

No Parallel Assessment

A single European peer review system that is recognised by all stakeholders. The process must be trusted and seen to have integrity by all users.

Managing Interests

Ensure that conflicts of interest from applicants and reviewers are identified and managed.

PRACE: principal values

Expert Assessment

Expert peer reviewers are used to assess the individual merit of all proposals against the published criteria.

Confidentiality

Proposals are treated in confidence by the organizer of the review. Those who advise will be required to do the same. The identities of all peer reviewers remains anonymous. All correspondence between peer reviewers and applicants goes through the organizer of the review (management office).

PRACE: principal values

Right to Reply

Applicants are given the right to reply to the expert reviewers' written assessments prior to proposals being prioritised.

Purpose is to correct factual inaccuracies in the reviewers' comments and allow the applicant to respond to any specific criticisms or suggestions of the reviewers.

Prioritisation

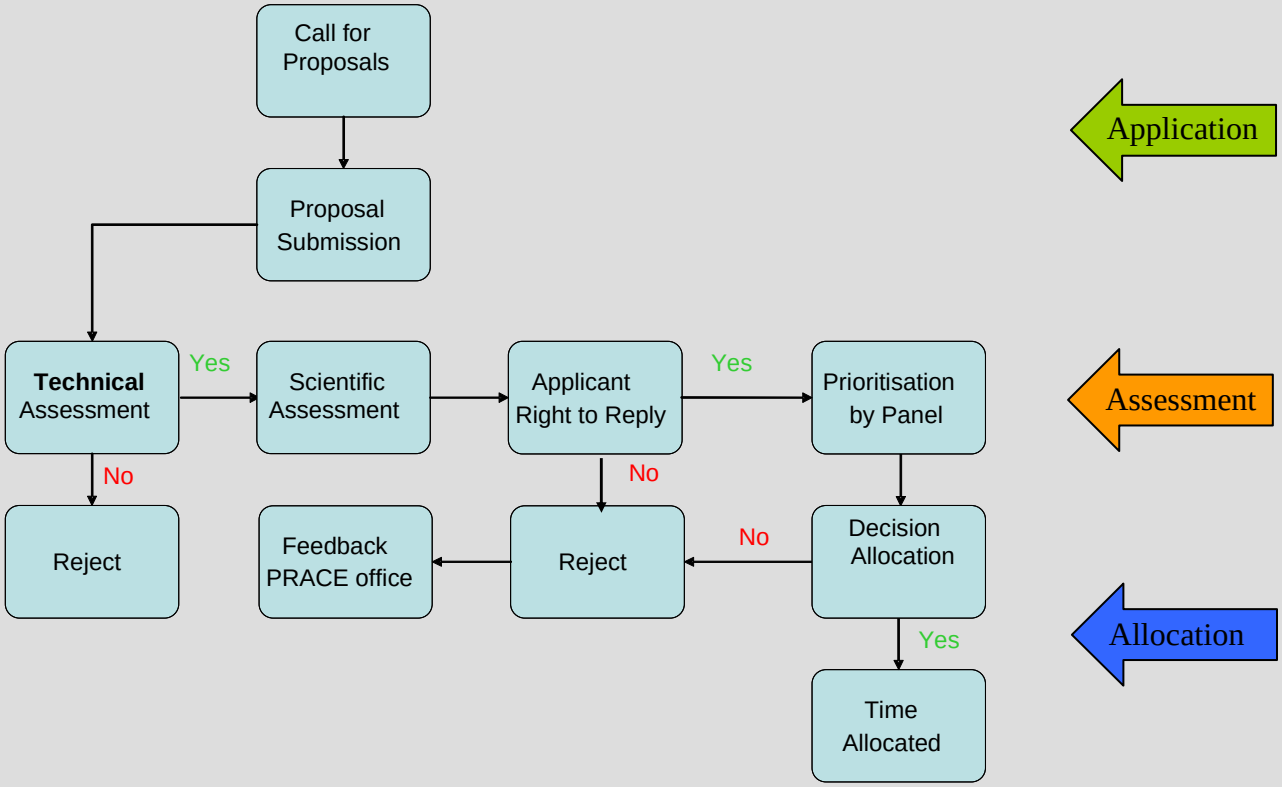
Proposals are prioritised against each other with direct reference to the published assessment criteria. No "cherry picking".

PRACE: Types of Access

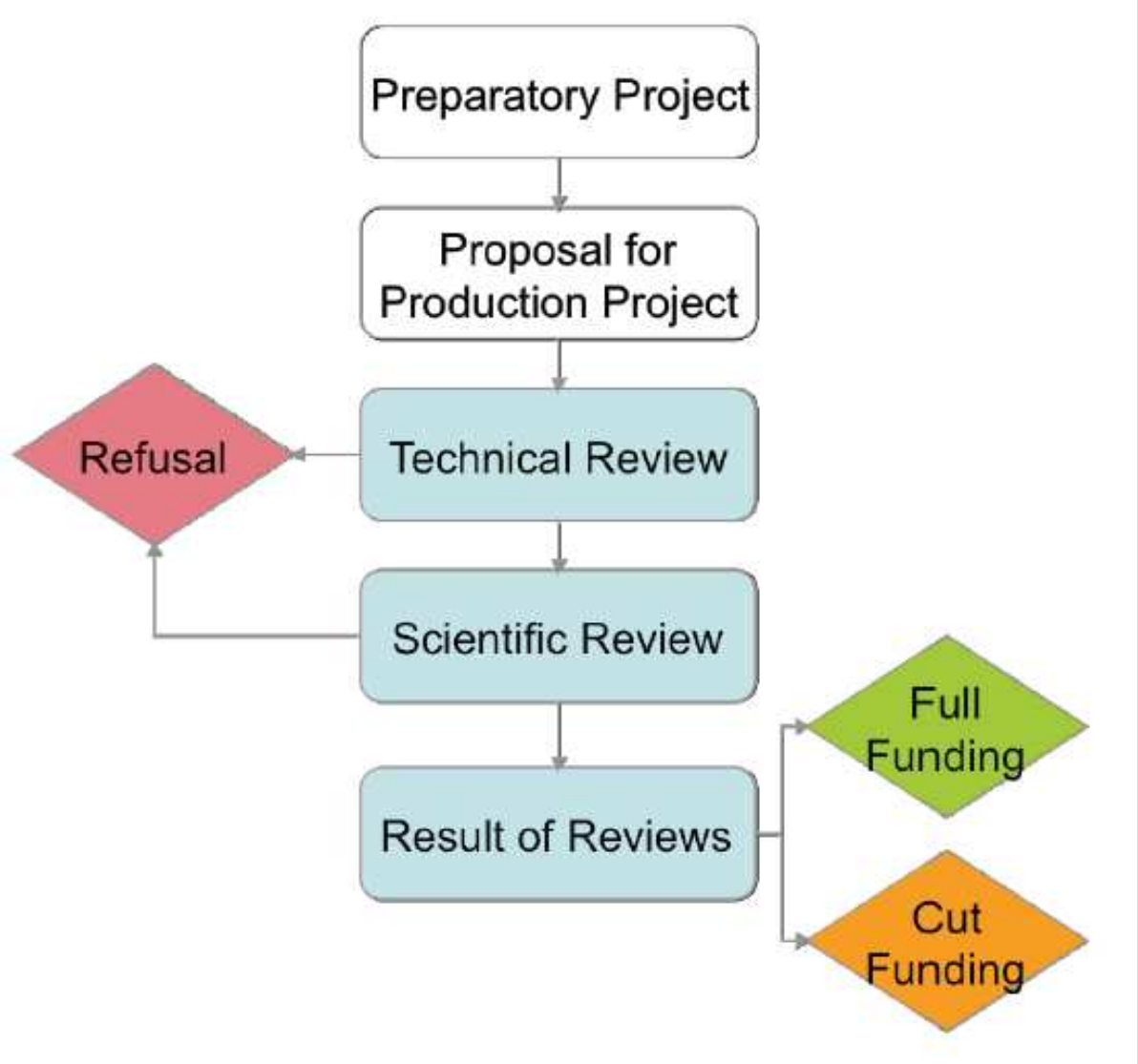
Preparatory: small allocations for code, scalability, software testing.
Project: common / production projects
Programme: large allocations for grand challenge projects from teams or consortia

	Preparatory	**Project**	**Programme**
Technical Assessment	Yes	Yes	Yes
Scientific Assessment	No	Yes	Yes
Additional Assessment	No	No	Potentially
Mid-term Review	No	No	Potentially
Duration	6 months	12 months	24 months
Final Report	Technical	General	General

PRACE: Peer Review



Example: Switzerland



Example: Switzerland

Technical Review \ Scientific Review	Grades 1	2	3
1	Full Allocation	Cut Allocation (max. 50%)	Refusal
2	Preparatory Project	Preparatory Project	Refusal
3	Refusal	Refusal	Refusal

European Grid Initiative

EGI does not currently have a peer review to determine access.

In EGEE and EGI, the NGIs and user communities (e.g., LCG) come with their own resources, possibly as in-kind to the project.

Peer review to determine access for a distributed computing infrastructure is also more complicated than for a single facility: heterogeneous resources, many stakeholders, dynamic availability of resources.

Requires the need for standardized units that describe the available resources (cycles, storage, …)

PRACE

Data infrastructure

Peer-review for scientific data infrastructure differs from HPC infrastructure.

A scientific data set often cannot be reviewed for scientific excellence.

Allocating a byte comes with different commitments than allocating a compute cycle.

Issues for scientific data infrastructure concern e.g.,

- Preservation of information, data curation
- Understand the appropriate metadata needed and how it is associated with the information
- Issues related to providing long-term access to the content

Data infrastructure

Requirements for access / open access:

- Which communities should be able to understand the information?
- Is the information such that it is independently understandable to the community, i.e., should the community be able to understand the information without needing the assistance of those who produced the information?
- Do there exist documented policies and procedures to ensure that the information is preserved against all reasonable contingencies, and which enable the information to be disseminated as authenticated copies of the original, or as traceable to the original?
- Does release of the information cause harm or violate rights? (Reasons may be that the information concerns human subjects, is protected by intellectual property rights, or exploiting the information might threat the environment or public)

Other observations

Peer review for scientific excellence. A research project (or infrastructure) that requests access to e-Infrastructure is typically already peer-reviewed by the funding agency. Should peer-review for e-Infrastructure repeat this (with the risk of coming to a different conclusion)?

Cloud computing, commercial providers. Peer-review in such environments may remain the same to determine scientific quality, but allocation mechanisms may change. Researchers may get grants directly from funding bodies to access/use commercial solutions. However, fragmentation of funding for access to infrastructure must be avoided as this will lead to non-optimal use of *funds*.

Other observations

Should European research infrastructures get prioritized access to European e-Infrastructure? E.g., should compute-intensive ESFRI initiatives get prioritized access to e-Infrastructure like PRACE and EGI?

Peer-review for e-Infrastructure should not only be for cycles and bytes, but should also include services, including application support, data support

Information sources used:

- Wikipedia
- PRACE Preparatory Phase
- EGEE/EGI