Interactive Open Access Publishing & Multi-Stage Open Peer Review:

Critical Rationalism at Work in Scientific Publishing & Quality Assurance

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Outline

Introduction

- *motivation & challenges*
- *peer review & critical rationalism*

Specific Concepts & Examples

- *Atmospheric Chemistry & Physics, European Geosciences Union*
- *JIIME, ETAI,* arXiv.org, *SciPost Physics …*

General Perspectives & Conclusions

- *mechanics & benefits of an epistemic web*
- *translation of scientific practice into critical rationalism and v.v.*

Motivation for Open Access

Educational, economic & scholarly advantages of
free & immediate online availability & usability of scholarly research articles

Educational:

- equal opportunities, information & stimulation *(global/social, teachers/students …)*
- re-integrate scholarly & common knowledge *(Wikipedia, real vs. alternative facts ...)*

Economic:

- facilitate innovation *(text mining by SME ....)*
- liberate distorted market of scientific information *(copyright ...)*

Scholarly:

- enhance interdisciplinary exchange, discussion collaboration
- **advance scholarly evaluation & quality assurance:** *open review & discussion, transparency & new metrics beyond citation counting oligopoly …*

Open Access Variants:

- **OA archiving** (*"green"*): good but not enough *(delays & limits in usability & sustainability)*
- **OA publishing** (*"gold"*): immediate & full benefits and sustainability

Pöschl Learned Publishing 2004; Frontiers Comp. Neuroscience 2012

Motivation for Open Peer Review

Traditional peer review is insufficient for efficient quality assurance in today's highly diverse & rapidly evolving world of science.

Editors & Reviewers: **limited capacities**

- work overload, conflicts of interest, little reward & incentive for constructive reviews

Traditional Pre-Publication Peer Review: **retardation & loss of information**

- delay of publication, dilution of messages, hidden obstruction/plagiarism
- critical & supportive comments unpublished/lost (often as interesting as paper)

  ⇒ *waste of reviewer capacities as most limited resource in scientific evaluation*

Traditional Discussion: **sparse & late commentaries**

- laborious, delayed & diluted by review (comment/article 1978 ⇒ 1998: 1/20 ⇒ 1/100)

Replacement of traditional pre-publication review by post-publication commenting not really successful (comments/article < 5/100)

Evolution into Multi-Stage Open Peer Review: combine & integrate strengths of traditional peer review with virtues of transparency, discussion & self regulation

Pöschl Learned Publishing 2004; Frontiers Comp. Neuroscience 2012

Scientific Peer Review & Critical Rationalism

Standard procedure of scientific criticism & quality assurance;
"heart of modern science"

Falsification

- identification & rejection of invalid hypotheses, methods, data, conclusions

Validation **(not Verification)**

- confirmation of valid (unfalsified) hypotheses, methods, data, conclusions by rebutted attempt of falsification

Improvement

- clarification of formulations, adjustment of conclusions …

Translation

- openness/transparency & self-regulation in science & society …
- facilitate discussion rather than attempt a final verdict …

Pöschl, Learned Publishing 2004; Frontiers Neuroscience 2012

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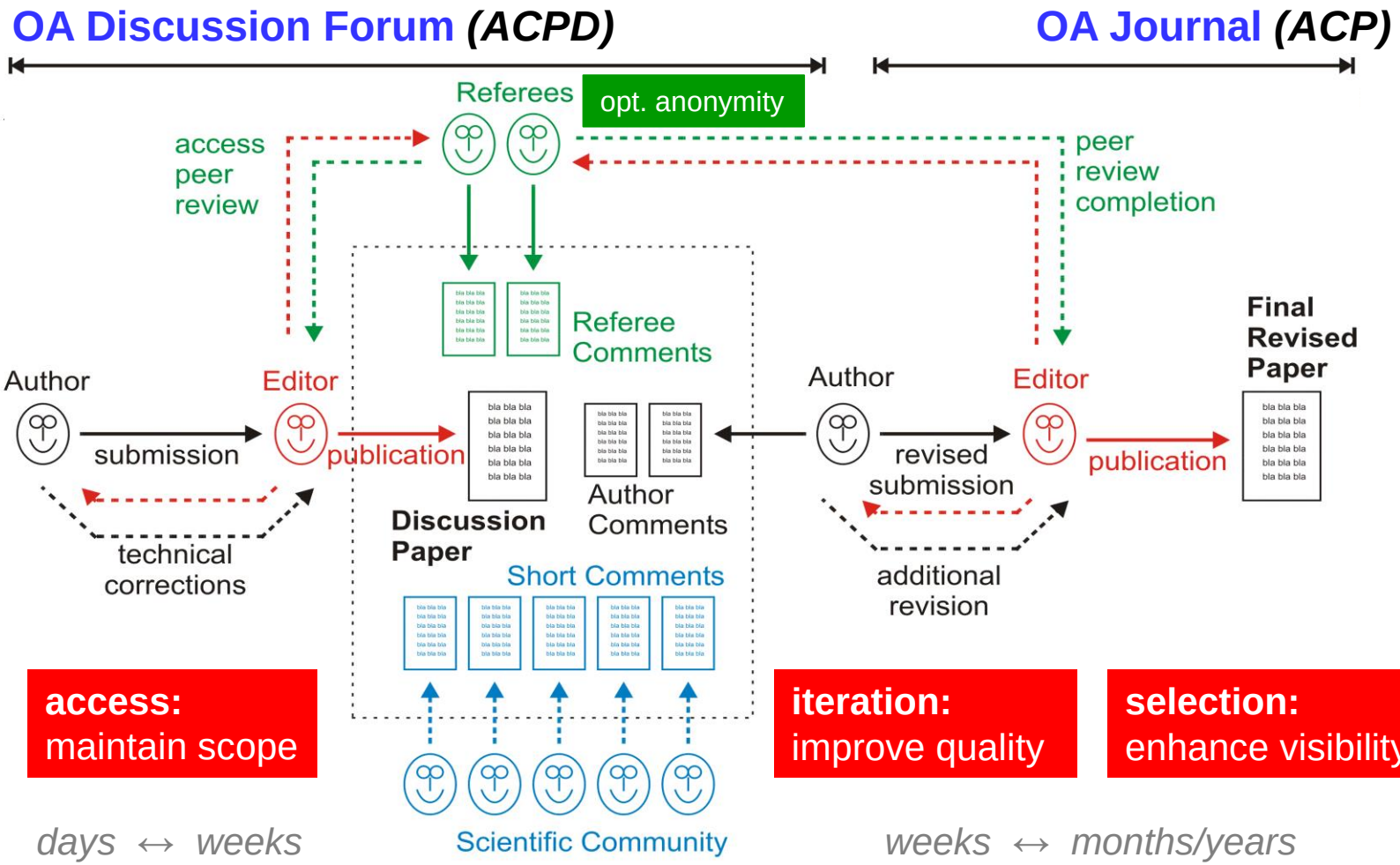
Multi-Stage Open Peer Review @ ACP/EGU

Flexible & transparent advancement of traditional journal review:



1. Pre-publication review & selection
short term

2. Public peer review & interactive discussion
mid-term, **integrative !**

3. Peer review completion
mid term

4. Post-publication review & evaluation
long-term, **ALM …**

Advantages

All-win situation: *authors, referees, editors, readers, community*

Discussion Paper

- **free speech**, rapid publication, citable record *(authors, readers)*

Public Peer Review & Interactive Discussion

- direct feedback & public recognition for high quality papers *(authors)*
- prevent hidden obstruction & plagiarism *(authors, editors)*
- **foster & document scientific discourse**: critical comments, constructive suggestions, complementary information *(authors, referees, readers, editors)*
- document controversial arguments & innovations or flaws & misconduct *(referees, editors, readers)*
- deter submission of weak & false papers ⇒ **save reviewer capacities** *(referees, editors)*

Final Paper

- ***maximize quality assurance & information density*** through integration of peer review, public discussion & final revision *(readers)*

Pöschl, Learned Publishing 2004; Frontiers Neuroscience 2012

Atmospheric Chemistry and Physics
An interactive open-access journal of the European Geosciences Union

ACP Online Library ***"Most Commented Papers":***
www.atmos-chem-phys.net/most_commented.html

Atmos. Chem. Phys., 16, 3761-3812, 2016
http://www.atmos-chem-phys.net/16/3761/2016/
doi:10.5194/acp-16-3761-2016

Volume 16, issue 6

Copernicus Publications
The Innovative Open Access Publisher

Research article

22 Mar 2016

Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous

James Hansen et al.

Hansen et al. 2016: *climate change, 110 comments, 138 000 downloads*
www.atmos-chem-phys.net/16/3761/2016/acp-16-3761-2016-discussion.html

Download

- Final revised paper (published on 22 Mar 2016)
- Supplement to the final revised paper
- Discussion paper (published on 23 Jul 2015)
- Supplement to the discussion paper

Interactive discussion

Status: closed

AC: Author comment | **RC**: Referee comment | **SC**: Short comment | **EC**: Editor comment

- Printer-friendly version - Supplement

SC C5202: 'SC Two papers that conflict with section 2.2. argument for Eemian "superstorm" activity', Andrew Revkin, 26 Jul 2015
- SC C5522: 'Is a 10% increase in wind speed enough to increase wave heights enough to move the Bahamian boulders in the Eemian?', Michael Wehner, 31 Jul 2015
  - AC C8101: 'Response to SC C5522', James Hansen, 15 Oct 2015
- AC C5615: 'Boulders in the Bahamas: Response to Comment by A. Revkin on paper Ice Melt, Sea Level Rise and Superstorms', James Hansen, 04 Aug 2015
  - SC C5885: 'Boulders show mega-tsunamis and multi-metre sea level rise could result from rapid Arctic warming; both precautionary and preventative actions are required urgently', John Nissen, 13 Aug 2015
    - AC C7872: 'Response to SC C5885', James Hansen, 12 Oct 2015
  - SC C6270: 'Speculations on superstorms', Max Engel, 26 Aug 2015
    - AC C7633: 'Reply to SC C6270 'Speculations on superstorms', Max Engel, 26 Aug 2015', James Hansen, 06 Oct 2015

SC C5208: 'Evidence and validation', Erik Stabenau, 26 Jul 2015
- SC C6508: 'Antarctic sea ice growth', Steven Marcus, 03 Sep 2015
  - AC C7963: 'Response to SC C6508', James Hansen, 13 Oct 2015
- AC C7962: 'Response to SC C5208', James Hansen, 13 Oct 2015

RC C5209: 'Very important but strenuous paper', David Archer, 27 Jul 2015
- SC C5270: 'Archer's comment on Hansen's new SLR paper', Rud Istvan, 27 Jul 2015
  - SC C5316: 'RE: Rud Istvan's reply to 'Archer's comment on Hansen's new SLR paper'.', Tim Pa
    - SC C5336: 'Greenland ice mass loss', Rud Istvan, 29 Jul 2015
      - AC C7878: 'Response to SC C5336', James Hansen, 12 Oct 2015
    - AC C7876: 'Response to SC C5316', James Hansen, 12 Oct 2015
  - AC C7874: 'Response to SC C5270', James Hansen, 12 Oct 2015

Short summary
We use climate simulations, paleoclimate data and modern observations to infer that continued high fossil fuel...
Read more

Journal metrics
IF 5.053
IF 5-year 5.656
SNIP 1.574
IPP 5.054
SJR 3.022
h5-index 92
Definitions

Abstracted/indexed
- Science Citation Index

Makarieva et al. 2008, 2013:
Meteorology, 33+20 comments
www.atmos-chem-phys-discuss.net/acpd-2008-0250/
www.atmos-chem-phys.net/13/1039/2013/acp-13-1039-2013-discussion.html

Makarieva et al. 2008: “On the validity of representing hurricanes as Carnot heat engine”

As in most scientific journals, the editors of ACP have full responsibility and authority to decide about acceptance or rejection of a manuscript submitted for publication. They are not bound by the referees’ ratings and recommendations, but obviously they should have good reasons if they overrule the referees’ recommendations.

In case of doubt and along the lines critical rationalism, I usually recommend and take decisions in favour of the authors of scientific papers, in particular when they address controversial topics and when the referees do not provide substantial and convincing arguments against acceptance and publication of the manuscript.

In the present case, however, a large number of expert referees consider the discussion paper as seriously flawed, and they have clearly explained their objections and explicitly recommended not to accept the revised manuscript for publication in ACP. The manuscript does not just present new concepts and results, but it also strongly criticizes and fundamentally opposes a large number of earlier studies (hurricane models and other meteorological concepts) and has already attracted substantial attention in the interactive public discussion in ACPD and beyond. [...]

Therefore, the ACP executive committee and I have come to the conclusion not to accept the revised manuscript for publication in ACP but to confirm the preceding editorial decision […]

According to the principles of critical rationalism and interactive open access publishing, ACP and ACPD will remain open for the publication, public review and interactive discussion of controversial and innovative scientific concepts and results.

Ulrich Pöschl on behalf of the ACP executive committee

Atmos. Chem. Phys. Discuss., 8, 17423, 2008. Atmos. Chem. Phys. Discuss., 8, S12406–S12411, 2009.

Makarieva et al. 2013: “Where do winds come from? A new theory on how water vapor …”

The authors have presented an entirely new view of what may be driving dynamics in the atmosphere. This new theory has been subject to considerable criticism which any reader can see in the public review and interactive discussion of the manuscript in ACPD (http://www.atmos-chem-phys-discuss.net/10/24015/2010/acpd-10-24015-2010-discussion.html).

Normally, the negative reviewer comments would not lead to final acceptance and publication of a manuscript in ACP. After extensive deliberation however, the editor concluded that the revised manuscript still should be published – despite the strong criticism from the esteemed reviewers – to promote continuation of the scientific dialogue on the controversial theory.

This is not an endorsement or confirmation of the theory, but rather a call for further development of the arguments presented in the paper that shall lead to conclusive disproof or validation by the scientific community. In addition to the above manuscript-specific comment from the handling editor, the following lines from the ACP executive committee shall provide a general explanation for the exceptional approach taken in this case and the precedent set for potentially similar future cases:
(1) The paper is highly controversial, proposing a fundamentally new view that seems to be in contradiction to common textbook knowledge.
(2) The majority of reviewers and experts in the field seem to disagree, whereas some colleagues provide support, and the handling editor (and the executive committee) are not convinced that the new view presented in the controversial paper is wrong.
(3) The handling editor (and the executive committee) concluded to allow final publication of the manuscript in ACP, in order to facilitate further development of the presented arguments, which may lead to disproof or validation by the scientific community.

Atmos. Chem. Phys. Discuss., 10, 24015, 2010. Atmos. Chem. Phys. Discuss., 10, C15277–C15278, 2013.

Makarieva et al. 2013: “Where do winds come from? A new theory on how water vapor …”

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Hansen et al. 2016: “Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 ° C global warming could be dangerous”

Discussion thread with denial of greenhouse effect and blackbody radiation (fundamentals of physics) by N. Swedan et al. (27 July -31 August 2015):
https://acp.copernicus.org/articles/16/3761/2016/acp-16-3761-2016-discussion.html

The editor decided to not accept further comments to this thread. Scientifically sound comments on other topics are possible until the end of the discussion phase. F. Dentener

Atmos. Chem. Phys. Discuss., 15, C6375–C6375, 2015, www.atmos-chem-phys-discuss.net/15/C6375/2015/

Dear Dr. Hansen,
following your substantial revisions, in response to my instructions and the remarks of the 4 reviewers, I am pleased to inform you that I decided to accept your publication. At this place I would like to thank the reviewers, and the many commenters to the earlier versions of this publication, for their substantial efforts that led to a considerable improvement of the ACPD paper. I would like to encourage the scientific community to engage in the critical experiments (observations and modelling) that could corroborate or falsify the main thesis of your publication. Given the potential significance and implications of the results, I will recommend to highlight this publication to the EGU’s press officer.

Atmos. Chem. Phys., 16, 3761–3812, 2016, https://doi.org/10.5194/acp-16-3761-2016.

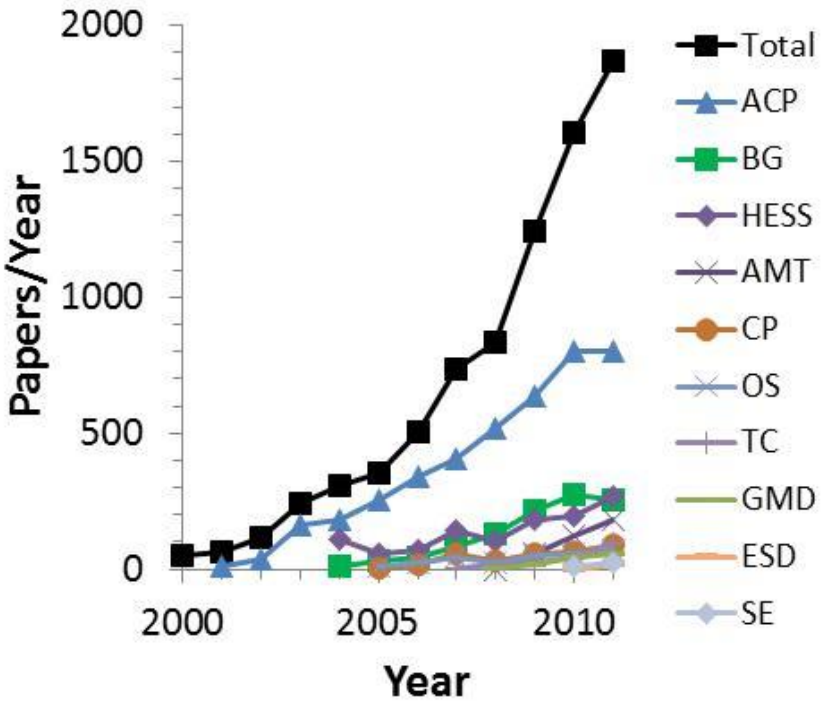
Achievements ACP/EGU

Atmospheric Chemistry & Physics (ACP)
launched 2001 with Nobel laureate P. Crutzen &
European Geosciences Union (EGU)

20 EGU sister journals since then:
Biogeosciences, Climate, Hydrology ...

Large-scale move to interactive OA publishing in geosciences:
> 10 000 papers; > 50 000 comments

Spread of concept to other communities/platforms:
Economics e-journal, SciPost Physics/arXiv.org, F1000 Research, Wellcome Open Research ...



Unique combination:

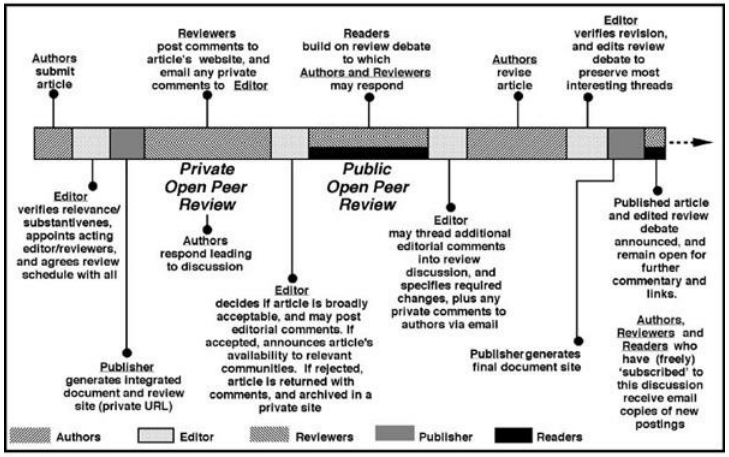
- top speed: 1+x weeks from submission to citable publication (discussion paper)
- **top impact & visibility** (across atmos., environ. & geosciences)
- **low rejection rate** (~15% vs. ~50+%)
- **large volume** (~10% of geoscience journal market)

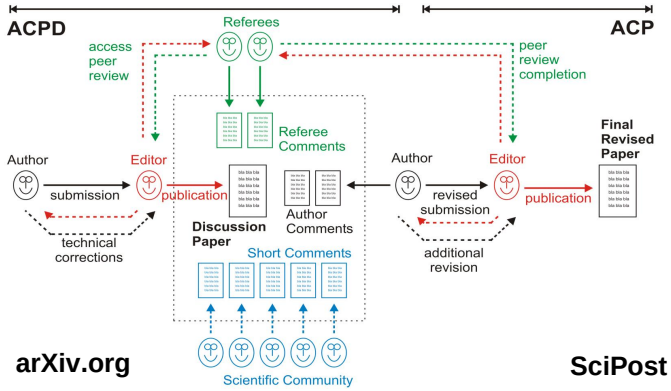
} **self-regulation by transparency**

- low cost (~1 kEUR/paper vs. ~2-4 kEUR/paper)
- fully self-financed & sustainable (incl. review, production, archiving & 10-20% surplus for publisher & society), 2019: ~ 5000 papers, ~ 5 MEUR turnover, > 500 kEUR surplus

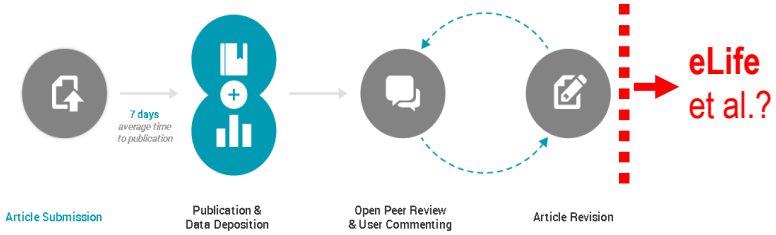
Pöschl Frontiers Comp. Neuroscience 2012

Development & Variants of Multi-Stage Open Peer Review





similar mechanics & options, why truncate ?



Electronic Journals (since 1996)

JIME: J. Interactive Media in Education, since 1996, returned to traditional review

ETAI: Electr. Transact. Artificial Intelligence, 1997-2002

… too complex/immature, too early ?

Forums/Repositories + Journals (since 2001)

ACP & EGU: Atmos. Chem. Phys. & European Geosciences Union,15 journals, since 2001

Economics E-Journal: since 2007

SciPost Physics/arXiv.org: since 2016

… well-defined, mature & successfully competing with traditional top journals

Platforms w/o Journals (since 2012)

F1000 Research: since 2012

Wellcome Open Research: since 2016

… technical advances vs. conceptual truncation ? how to attract & maintain high quality ?

Pöschl Front. Comp. Neurosci. 2012

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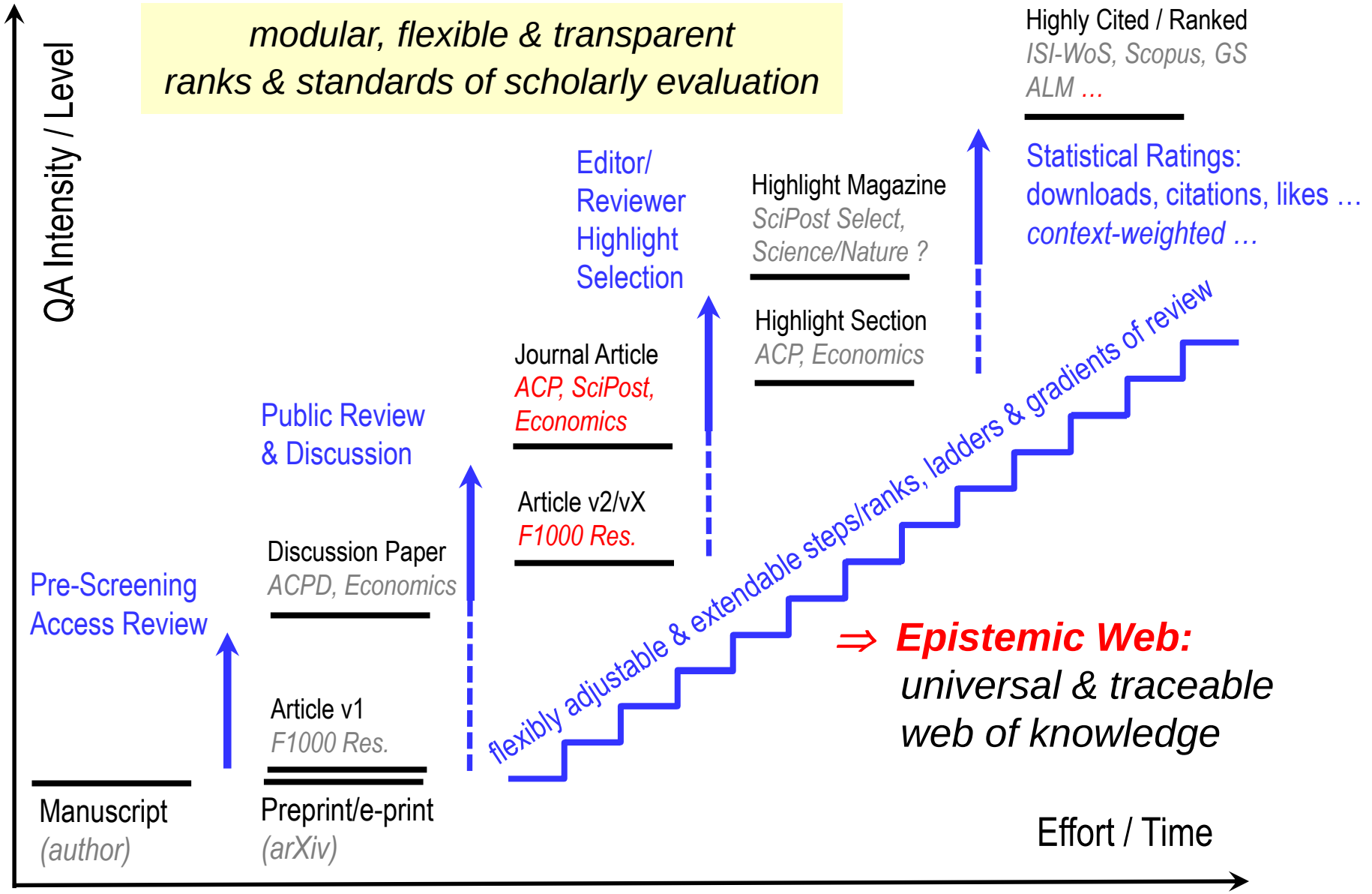
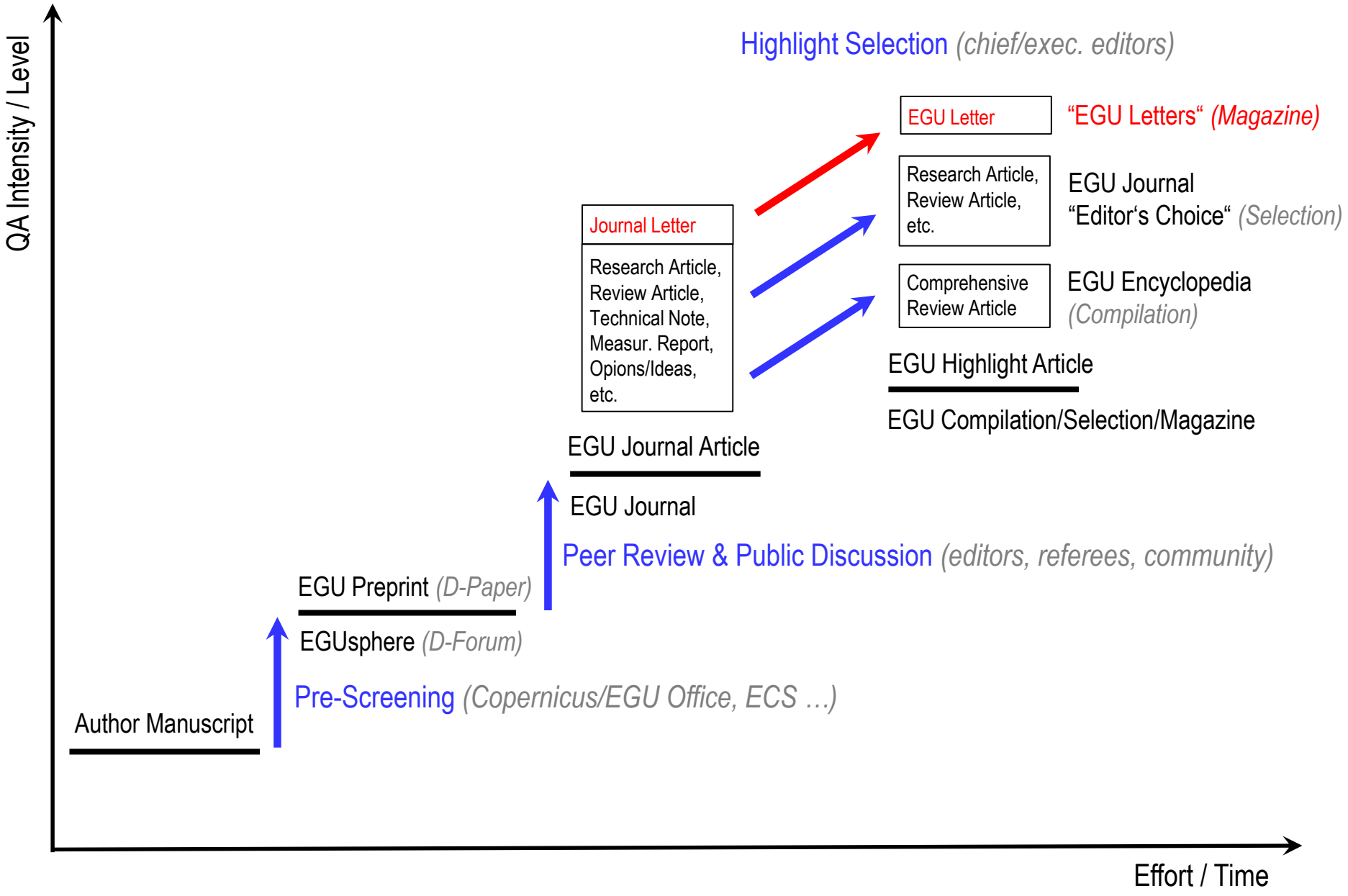
Multi-Stage Open Peer Review



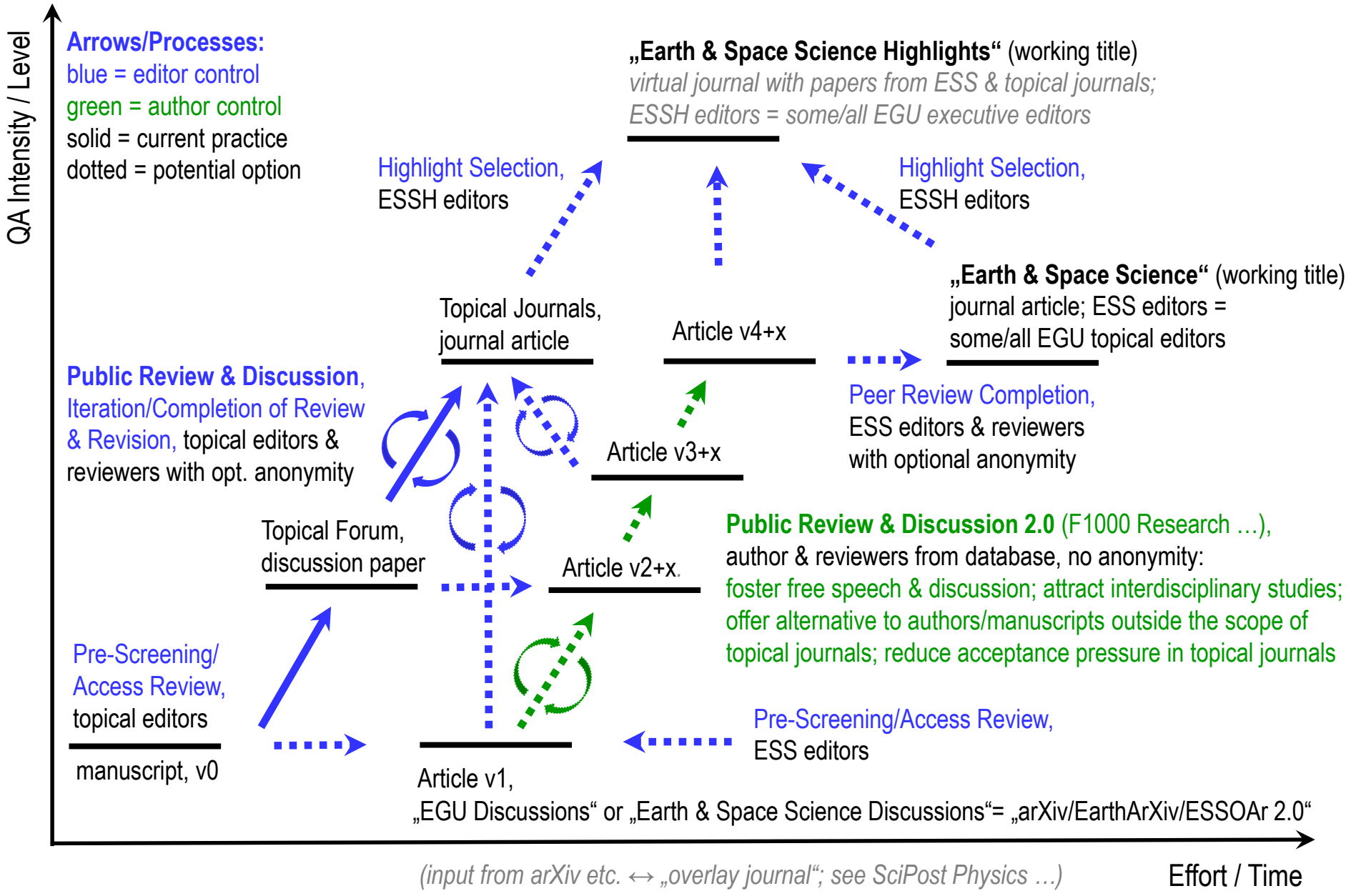
Pöschl Front. Comp. Neurosci. 2012, Hyman & Renn, Edition OA 2012

EGU Multi-Stage Peer Review & Highlight Selection



Interactive OA Publishing 2.0

(advanced modular multi-stage open peer review system)



Vision

Promote societal progress by Open Access & Open Peer Review in global commons of scholarly information.

Provide access to high quality scientific publications

review & revision involving the community

$\Rightarrow$ *more & better information for scientists & society*

Document the scientific discourse

public record of scientific evidence, arguments & progress

$\Rightarrow$ *universal & traceable web of knowledge* ***(epistemic web)***

Demonstrate transparency & rationalism

transparent & rational approach to complex questions & problems

$\Rightarrow$ *role model for societal decision processes*

Scientific Peer Review & Critical Rationalism

Standard procedure of scientific criticism & quality assurance;
"heart of modern science"

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- confirmation of valid (unfalsified) hypotheses, methods, data, conclusions by rebutted attempt of falsification

Improvement

- clarification of formulations, adjustment of conclusions …

Translation

- openness/transparency & self-regulation in science & society …
- facilitate discussion rather than attempt a final verdict …

Pöschl, Learned Publishing 2004; Frontiers Neuroscience 2012

Further References I

The following references and links provide orientation about the development and perspectives of open access in general and interactive open access publishing with public peer review and interactive discussion in particular (multi-stage open peer review as practiced at EGU).

1. Open Access Declarations & Initiatives

1.1. Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities

http://openaccess.mpg.de/286432/Berlin-Declaration
http://openaccess.mpg.de/319790/Signatories
http://openaccess.mpg.de/mission-statement_en
http://openaccess.mpg.de/1527674/Session_II
http://openaccess.mpg.de/1528633/Session-2-Poeschl.pdf

1.2. Bethesda Statement on Open Access Publishing

http://legacy.earlham.edu/~peters/fos/bethesda.htm

1.3. Budapest Open Access Initiative

http://www.budapestopenaccessinitiative.org/
http://www.budapestopenaccessinitiative.org/boai-10-recommendations
http://www.opensocietyfoundations.org/voices/opening-access-research

2. Development & Concepts of Interactive Open Access Publishing & Public Peer Review

2.1. Multi-stage open peer review: scientific evaluation integrating the strengths of traditional peer review with the virtues of transparency and self-regulation

http://journal.frontiersin.org/Journal/10.3389/fncom.2012.00033/abstract

2.2. Interactive journal concept for improved scientific publishing and quality assurance

http://www.ingentaconnect.com/content/alpsp/lp/2004/00000017/00000002/art00005

Further References II

2.3. A Short History of Interactive Open Access Publishing
http://publications.copernicus.org/A_short_History_of_Interactive_Open_Access_Publishing.pdf
2.4. EGU Position Statement on the Status of Discussion Papers Published in EGU Interactive Open Access Journals, European Geosciences Union 2010
http://www.egu.eu/about/statements/position-statement-on-the-status-of-discussion-papers-published-in-egu-interactive-open-access-journals/
2.5. Further initiatives & visions of open evaluation
http://www.economics-ejournal.org/
http://f1000research.com/
https://www.scienceopen.com/
http://www.frontiersin.org/Computational_Neuroscience/researchtopics/Beyond_open_access:_visions_for_open_evaluation_of_scientific_papers_by_post-publication_peer_review/137