

# The Future of Publication in the Statistical Sciences

Report of the ASA Panel on The Future of Publications

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## Summary

Academic publication is on an irreversible trajectory moving in the direction of on-line, dynamic, open-access publishing models. Print publications will cease to exist in their current format, largely due to the evolving culture, the changing needs of academic readers, shrinking budgets of academic libraries, and the availability of enabling technologies. The American Statistical Association (ASA) should prepare for accommodating this shift in the very near future and to the fullest extent possible in light of existing agreements and contacts, and pending legislation on access to federally-funded research. The forms that publishing will take in the future is less clear than the inevitability of its change. Thus the prudent course of action is to consider strategies that will position the ASA to be a leader in the era of online publishing while maintaining sufficient flexibility to take advances of technological changes in the storing, searching, and peer evaluation of statistical research.

## Introduction

In his cover letter to panel members ASA President Robert N. Rodriguez noted that "... the academic publishing world is in a state of flux. The reasons for this include the high costs of some publications, significant technological changes in the way journals can be produced, frustration with the amount of time it takes a paper to proceed from submission to publication, and new ways of thinking about who pays for access to published materials." The panel was formed to take "a high-level look at the future of publishing from the standpoint of our association [ASA]."

The ASA's journals serve its membership and the profession more generally. The main purpose of a scholarly journal is information transfer. Journals provide a medium for the presentation of new research. Ideally, peer review serves both as insurance that the reported research has been conducted properly and reported thoroughly, and as a quality filter for sorting research by its perceived importance or projected impact on the field.

Publication in an ASA journal (or in any of many other highly-regarded journals) is an indicator of quality and as such informs decisions by tenure and reappointment committees, granting agencies, awards committees, and the like. In industry, peer-reviewed publications often provide the justification for methods used in regulatory submissions. Since we live in a world where almost all reasonable material can be "published," the need for indicators to help identify the most promising and reliable research is indisputable. That need will not diminish in the future, and likely will increase in importance. Thus future modes of publication must provide a viable means of indicating quality that is arguably (and perhaps even demonstrably) better

than existing methods, else gaining acceptance from the statistics community, as well as confidence from other communities of researchers, will be difficult.

Although most authors would be delighted with an accept-without-revision decision, many authors would also acknowledge the benefits of a careful and critical reading of their work and the opportunity to revise. Current publication practices provide a means for improving quality of the research and its exposition via peer review. Honest feedback is useful if sometimes discomfoting. Ideally, future modes of publication will need to provide a means for delivering honest, unbiased feedback of a quality at least as high as that provided by current peer review practices.

In addition to providing indications of research quality and importance, and enhancing research via useful feedback more effectively than current practices, doing so in less time, at lower cost (money and human), and with greater accessibility is the real promise of new modes of publication. Belief that such gains are possible are founded in technological changes of the digital, web-based variety, and increasing acceptance of online communication and interaction as typified by social networks.

Changes to the current system of peer review and publication should ideally improve the scientific process (and most certainly do no harm) while preparing the profession and the professional societies for a future that may look quite different from the present. Two ways to improve the current peer-reviewed scientific process are by moving toward open access and reducing time to publication. To do no harm to the scientific process, quality indicators and filters are extremely important.

With open access and the attendant loss of subscriptions comes the need to explore different forms of generating the revenue for sustaining publications whatever form they take in the future. This is important for the future vitality of the ASA more generally than simply its publications activities. By viewing publications as a form of service to its members and the society raises the question of how best to provide that service in the future, and complement it with attractive new services made possible by current and future technology for adding value to digital statistical information.

## **Open Access**

The future of publication will be shaped to a great extent by the future of open access, whose fate is in the process of being determined.

The Federal Research Public Access Act (FRPAA) was introduced on Feb 9, 2012, and is currently in committee. This legislation would both extend the NIH public-access policy to other federal funding agencies, and strengthen it by decreasing the embargo from one year to six months.

In addition to the open-access movement's path through Congress, it is taking a

path through the Executive Branch. In May, a petition on [whitehouse.gov](http://whitehouse.gov) asking the President to require open access to scientific manuscripts reached the 25,000 signatures needed for the White House to consider the petition.

Even if the president does not sign the Executive order, the heads of the each funding agency can create a policy mandating open access. NIH has set a precedent that other funding agencies could easily follow.

Open Access is also a movement internationally: in mid-June, the UK's Finch Report [2] urged open access for UK publicly funded work:

We therefore recommend that: a clear policy direction should be set towards support for publication in open access or hybrid journals, funded by APCs [article processing or publishing charges], as the main vehicle for the publication of research, especially when it is publicly funded.

As suggested by the preceding quote, open-access journals reverse the business model for published research. Whereas traditionally the cost of publication was paid for via subscription revenues and thus are reader-based fees, most open-access journals pay for publication via article processing/publishing charges (APCs) and thus are author-based. Readers then have free and immediate access with minimal restrictions.

The ASA needs to prepare for a future where open access will be the norm. This includes consideration of alternative funding models, e.g., article processing/publishing charges, or pay-per-view, or by regaining revenue through the provision of repository services (described below).

## **Academic Publication**

In broad strokes an academic research paper generally has three stages: pre-publication; the publication process proper (submission, review, revision, resubmission); and post-publication. Following is a stylized view of those stages, present and future.

*Pre-publication.* In the not-too-distant past papers in the pre-publication stage were called preprints, and appeared as technical reports, mimeo series, working papers, proceedings, etc. These formats were used to stake a claim on a research topic, disseminate research to colleagues for comment, present a full and complete accounting of the research, and provide a draft from which to prepare a polished paper for journal submission. Currently most journals and their editorial staffs play no role in this stage.

In the not-too-distant future ...

Authors who prefer to work in an open environment and who are comfortable that the threat to their intellectual property is minimal, will have the technological means to post pre-publication papers online to a searchable server with capabilities for notifying colleagues, open commenting, and online revision with change tracking. Computational algorithms, simulation study code, and data used in the paper will be available on demand. These living documents will be cross linked to facilitate navigating the server efficiently. Think of this as a technology turbo-charged, open-access, working paper series.

Of course, some researchers will not want to work in such an open environment for various reasons, including, for example, personal preference, or concerns about protecting intellectual property.

*Publication process.* Apart from digital copies replacing hard copies, the publication process has not changed much over the course of our (the panelists') careers. An author targets a journal, submits a paper, waits for peer reviews, revises, and resubmits to the same journal; or is rejected or disillusioned and takes his/her offering to another journal to restart the process.

In the not-too-distant future ...

Papers submitted for publication will be posted online to a searchable server with capabilities for notifying colleagues, open commenting, and evaluation via *quality flags* (Likes, Dislikes, hits, downloads, and others yet to be determined). Computational algorithms, simulation study code, and data used in the paper will be available on demand. Papers are published online immediately, with review comments offered voluntarily and openly.

If editorial staffs are not already obsolete and journals are not *passée*, then editors, in addition to responding to papers submitted directly to their journal, will monitor the server for papers generating sufficient interest to be invited to submit, with full review for publication in a prestigious journal.

Or ...

The recognition that unsolicited and open commentary is not likely to be either honest or unbiased will render suspect, and therefore useless, crowd-sourced measures of quality (who would openly criticize another researcher's work if that person was

likely to review your grant proposal?). This in turn will adversely affect the revising process, thereby retarding the development of statistical science and undermining its credibility. Thus perhaps in the future ... An author targets a journal, submits a paper, waits for peer reviews, revises, and resubmits to the same journal; or is rejected or disillusioned and takes his/her offering to another journal to restart the process, in other words “business as usual.”

Or ...

Recognizing the benefits of blind peer review (if not double-blind), innovative strategies for facilitating timely peer review are implemented, including the use of incentives and ‘quid pro quo’ policies, journal/review cascading strategies, and holding authors accountable for their role in the review process. Peer review is maintained and improved, and time to publication is reduced.

For example, referee incentives could be tied to certain of the business models adopted to replace subscription revenue: article processing fees could be waived in a pay-to-submit/publish model; or free downloads granted in a pay-per-view model; or free access granted in a repository-based model.

Cascading refers to the strategy of automatically (with the author’s consent) having a paper that is rejected by Journal A submitted to Journal B, in which case the reviews from the rejecting journal are sent to the second journal, along with author rebuttal/explanation if the author so desires. Cascading already takes place within statistics, but in an inefficient and haphazard manner. (It is being used in other disciplines, e.g., in ecology papers submitted to *Ecology Letters* cascade to *Ecology and Evolution* subject to author approval.<sup>1</sup>) Designed cascading can shorten the time to publication, and saves on refereeing effort by reusing reviews. There are pros and cons to cascading, but it offers options attractive enough for further evaluation.

*Post publication.* In the current system, the pre-publication and submission/resubmission stages of the research paper are dynamic with the paper changing for the better (presumably). The third stage was (and with print media necessarily is) essentially static,

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<sup>1</sup>**Author Guidelines for Ecology Letters:** Ecology Letters works together with Wiley’s open access journal, Ecology and Evolution, to facilitate the rapid publication of good quality research that is unable to be accepted for publication by our journal. Authors may be offered the option of having the manuscript, along with any related reviews, automatically transferred for consideration by the Editor of Ecology and Evolution. Manuscripts would not need to be reformatted or rewritten at this stage, and publication decisions will be made a short time after the transfer takes place. The Editor of Ecology and Evolution will accept submissions that report well-conducted research which reaches the standard acceptable for publication. Accepted papers can be published rapidly, typically within 15 days of acceptance.

with the only changes or additions resulting from corrections or via responses to letters to the editor.

In the not-too-distant future ...

Published papers will be posted online to a searchable server with capabilities for notifying colleagues, open commenting, and evaluation via *quality flags*. Computational algorithms, simulation study code, and data used in the paper will be available on demand. Capabilities for verifying computational-based claims (simulation results, data analyses) will be available. Comparisons among published methods and unpublished methods will be facilitated by the availability of code and the imposed demand for reproducibility. Reader/user discovered advantages and limitations of a published method can be linked to the paper. Corrections can be posted online and an author could upload more simulation results or more data analyses in response to reader queries.<sup>2</sup>

Few would find fault with the visions of the pre-publication or post-publication futuristic views described above. A relevant question is whether the ASA (or other societies) want to get involved in the pre-publication stage. Doing so would be a benefit to those members of the profession who choose to use it, but at what cost? A post-publication commenting system has a lot of appeal and can be justified in part with open-access and reproducible-research arguments. Whether interest is sufficient to sustain a vibrant post-publication commenting system is another matter.

Regarding the publication stage, neither of the extreme views, ‘business as usual’ or ‘abolish blind peer review’ are attractive options. Whatever the current mode of peer reviews evolves into (and it should evolve), it must provide the requisite indicators of research quality and importance, and a means of delivering unbiased, critical feedback to authors.

While the next major evolutionary stage of academic publication remains unpredictable, the path toward enabling that evolution is reasonably clear. Web-based technologies for storing, searching, commenting, linking, and modifying documents will drive publication evolution in the near future. Thus, preparing for that future entails developing the capabilities for authors and readers to interact over an online document with capabilities as described above. Whether this called a preprint server, a science social networking site, a living-document repository, etc. is not important.

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<sup>2</sup>It has come to the panel’s attention that Rob Tibshirani at Stanford is working to establish a post-publication commenting system on PubMed so that scientists can provide open available feedback on papers, e.g., pointing out errors or providing a measure of reality to papers that have been over-promoted in the popular literature.

The functionality is.

### **Repository Publication and Services**

An expansive view of the online capabilities described above is a repository of “all things statistical.” A comprehensive repository would eventually include government statistical reports, IOM and NAS reports, all statistics and probability Ph.D. theses, materials for AP statistics and junior college statistic courses including full online college courses, online versions of short courses, online versions/proceedings of major conferences, blogs, accreditation and continuing education offerings etc., in addition to the more traditional documents, i.e. published papers and preprints.

Ideally, the ASA would forge partnerships with as many of the other national and international statistical organizations as possible so that the repository could be most exhaustive and valuable.

The business model for sustaining the repository is crucial. ASA and partnering societies could regain revenues through the provision of enhanced digital services maximizing the utility of the repository. For example, by linking peer-reviewed journal articles to conference talks, to webinars, etc. Revenue could be generated by fees for virtual attendance at short courses and conferences etc. “hosted” on the repository, and possibly for access to all or parts of the repository. Society members would receive access to the enhanced materials through subscription; others might use services on a pay-per-view model.

### **Recommendations**

There is a wide range of opinions on the panel regarding the future of publication (and anecdotal evidence that very strong and varied opinions can be found among our colleagues as well). However, there is uniform agreement that change is inevitable, and that the ASA should take action sooner rather than later. The publication process will likely be well protected by the community of scholars. However, the health and well-being of the ASA might be more at risk as fewer ASA members are staying or joining to get its journals delivered to their offices. In the face of digital open access, journal subscriptions will decline.

However, without widespread buy-in from the profession, changes to the ASA’s mode of publications runs the risk of alienating authors and losing them to other journals. Thus it would be a mistake not to take the pulse of the membership and the population of ASA journal authors and readers prior to acting. Furthermore, in the event that substantial changes are in the offing, effectively communicating those

changes to members and authors will be essential. Thus our first recommendation is to:

1. Communicate the variety of online publication options to the ASA membership and journal users, and solicit feedback from them regarding the publication and revenue-generating models they would like to see implemented.

A possibility for communicating options to interested individuals would be to publish in TAS (and possibly simultaneously in other societies' journals) an article providing an even-handed, professional description of options for future publishing services and revenue generation.

Making a major change to ASA journal operations would be difficult without other major societies on board or at least being informed. Recent UK reports on peer review [1] and open access [2] underscore that the issues facing the ASA are international. Thus our second recommendation is to:

2. Solicit feedback from other potential partnering societies such as the IMS and RSS, and other major journal operations with an invitation to be involved in and coordinate with any changes made to ASA journal operations, or the offering of online repository services.

After learning the level of involvement and commitment of other societies to this undertaking feasibility must be determined.

3. Obtain detailed costs of implementing the type of repository mentioned above for working with dynamic online research documents and the comments they generate.

Assuming that no red flags are found in Steps 1-3, and based on the membership's collective opinion on the desirability of the possible options:

4. Start by implementing an online living-document repository with some subset of the capabilities and services type described above, to be run in parallel with the ASA's current journal operations. Simultaneously, implement changes to the submission and review processes for all ASA journals, with a view to optimizing their operation in light of the membership's opinion on the various options for doing so (e.g., cascading, referee incentives, etc.). The idea is to set up parallel systems, each optimized to the extent possible, and give authors the option of

publishing to the online repository or submitting to an existing journals. An electronic system has the capability of allowing authors to choose whether to make their research available through journal submission, or via new online posting with crowd-peer reviewing. Thus the two systems would “compete” for papers.

There is a lot more thought and work that needs to go into the “competition” phase to make it an informative comparison, e.g., soliciting contributions from prominent senior statisticians to help jump start the online repository. The competition phase will enable assessment of the true level of interest among members and allow for testing and evaluating quality rating systems, thus providing the hard data needed to evaluate a wholesale change in operations.

This four-step process will start the ASA down the path to modernizing its journal operations while keeping its options open. Ideally, there will be more information on the state of open access in time to inform the last step.

## Appendix

The two recent reports from the UK cited in our report deal with many of the publication-related issues facing the ASA. For reference, the summary from each is attached.

## References

- [1] House of Commons, Science and Technology Committee - Eighth Report of Session 201012 *Peer review in scientific publications*. Ordered by the House of Commons to be printed 18 July 2011.  
<http://www.publications.parliament.uk/pa/cm201012/cmselect/cmsctech/856/856.pdf>
- [2] Report of the Working Group on Expanding Access to Published Research Findings, *Accessibility, sustainability, excellence: how to expand access to research publications*.  
<http://www.researchinfonet.org/wp-content/uploads/2012/06/Finch-Group-report-FINAL-VERSION.pdf>

## Summary

Peer review in scholarly publishing, in one form or another, has always been regarded as crucial to the reputation and reliability of scientific research. In recent years there have been an increasing number of reports and articles assessing the current state of peer review. In view of the importance of evidence-based scientific information to government, it seemed appropriate to undertake a detailed examination of the current peer-review system as used in scientific publications. Both to see whether it is operating effectively and to shine light on new and innovative approaches. We also explored some of the broader issues around research impact, publication ethics and research integrity.

We found that despite the many criticisms and the little solid evidence on the efficacy of pre-publication editorial peer review, it is considered by many as important and not something that can be dispensed with. There are, however, many ways in which current pre-publication peer-review practices can and should be improved and optimised, although we recognise that different types of peer review are suitable to different disciplines and research communities. Innovative approaches—such as the use of pre-print servers, open peer review, increased transparency and online repository-style journals—should be explored by publishers, in consultation with their journals and taking into account the requirements of their research communities. Some of these new approaches may help to reduce the necessary burden on researchers, and also help accelerate the pace of publication of research. We encourage greater recognition of the work carried out by reviewers, by both publishers and employers. All publishers need to have in place systems for recording and acknowledging the contribution of those involved in peer review.

Publishers also have a responsibility to ensure that the people involved in the peer-review process are adequately trained for the role that they play. Training for editors, authors and reviewers varies across the publishing sector and across different research institutions. We encourage publishers to work together to develop standards—which could be applied across the industry—to ensure that all editors, whether staff or academic, are fully equipped for the job that they do. Furthermore, we consider that all early-career researchers should be given the option for training in peer review; responsibility for this lies primarily with the funders of research.

Funders of research have an interest in ensuring that the work they fund is both scientifically sound and reproducible. We consider that it should be a fundamental aim of the peer-review process that all publications are scientifically sound. Reproducibility should be the gold standard that all peer reviewers and editors aim for when assessing whether a manuscript has supplied sufficient information to allow others to repeat and build on the experiments. As such, the presumption must be that, unless there is a strong reason otherwise, data should be fully disclosed and made publicly available. In line with this principle, data associated with all publicly funded research should, where possible, be made widely and freely available. The work of researchers who expend time and effort adding value to their data, to make it usable by others, should be acknowledged and encouraged.

While pre-publication peer review (the first records of which date back to the 17<sup>th</sup> century)

continues to play an important role in ensuring that the scientific record is sound, the growth of post-publication peer review and commentary represents an enormous opportunity for experimentation with new media and social networking tools. Online communications allow the widespread sharing of links to articles, ensuring that interesting research is spread across the world, facilitating rapid commentary and review by the global audience. They also have a valuable role to play in alerting the community to potential deficiencies and problems with published work. We encourage the prudent use of online tools for post-publication review and commentary as a means of supplementing pre-publication review.

On the subject of impact, it was clear to us that the publication of peer-reviewed articles, particularly those that are published in journals with high Impact Factors, has a direct effect on the careers of researchers and the reputations of research institutions. Assessing the impact or perceived importance of research before it is published requires subjective judgement. We therefore have concerns about the use of journal Impact Factor as a proxy measure for the quality of individual articles. While we have been assured by research funders that they do not use this as a proxy measure for the quality of research or of individual articles, representatives of research institutions have suggested that publication in a high-impact journal is still an important consideration when assessing individuals for career progression. We consider that research institutions should be cautious about this approach as there is an element of chance in getting articles accepted in such journals. We have heard in the course of this inquiry that there is no substitute for reading the article itself in assessing the worth of a piece of research.

Finally, we found that the integrity of the peer-review process can only ever be as robust as the integrity of the people involved. Ethical and scientific misconduct—such as in the Wakefield case—damages peer review and science as a whole. Although it is not the role of peer review to police research integrity and identify fraud or misconduct, it does, on occasion, identify suspicious cases. While there is guidance in place for journal editors when ethical misconduct is suspected, we found the general oversight of research integrity in the UK to be unsatisfactory. We note that the UK Research Integrity Futures Working Group report recently made sensible recommendations about the way forward for research integrity in the UK, which have not been adopted. We recommend that the Government revisit the recommendation that the UK should have an oversight body for research integrity that provides “advice and support to research employers and assurance to research funders”, across all disciplines. Furthermore, while employers must take responsibility for the integrity of their employees’ research, we recommend that there be an external regulator overseeing research integrity. We also recommend that all UK research institutions have a specific member of staff leading on research integrity.

## Executive Summary

This report tackles the important question of how to achieve better, faster access to research publications for anyone who wants to read or use them. It has been produced by an independent working group made up of representatives of universities, research funders, learned societies, publishers, and libraries. The group's remit has been to examine how to expand access to the peer-reviewed publications that arise from research undertaken both in the UK and in the rest of the world; and to propose a programme of action to that end.

We have concentrated on journals which publish research results and findings. Virtually all are now published online, and they increasingly include sophisticated navigation, linking and interactive services. Making them freely accessible at the point of use, with minimal if any limitations on how they can be used, offers the potential to reap the full social, economic and cultural benefits that can come from research.

Our aim has been to identify key goals and guiding principles in a period of transition towards wider access. We have sought ways both to accelerate that transition and also to sustain what is valuable in a complex ecology with many different agents and stakeholders. The future development of an effective research communications system is too important to leave to chance. Shifts to enable more people to have ready access to more of the results of research will bring many benefits. But realising those benefits in a sustainable way will require co-ordinated action by funders, universities, researchers, libraries, publishers and others involved in the publication and dissemination of quality-assured research findings.

### 1. The issue

Communicating research findings through journals and other publications has for over 350 years been at the heart of the scientific and broader research enterprise. Such publications have been remarkably successful in enabling researchers to build on the work of others, to scrutinise and refine their results, to contribute additional ideas and observations, and to formulate new questions and theories. They play a key role in the complex ecology of research, both for researchers themselves and for all those in society at large who have a stake or an interest in the results of their work

The internet has brought profound change across all sectors of society and the economy, transforming interactions and relationships, reducing costs, sparking innovation, and overturning established modes of business. Researchers and journal publishers were quick to embrace the digital and online revolutions. But there is a widespread perception, in the UK and across the world, that the full benefits of advances in technologies and services in the online environment have yet to be realised.

Most researchers in the higher education (HE) and related sectors and in large research-intensive companies have access to a larger number of journals than ever before, at any time of day, and wherever they can connect to the internet. But in the rapidly-developing online environment they want more: online access free at the point of use to all the nearly two million articles that are produced each year, as well as the publications produced in the past; and the ability to use the latest tools and services to analyse, organise and manipulate the content they find, so that they can work more effectively in their search for new knowledge. Better, faster communication can bring better research.

Most people outside the HE sector and large research-intensive companies - in public services, in the voluntary sector, in business and the professions, and members of the public at large - have yet to see the benefits that the online environment could bring in providing

access to research and its results. For many of them, the only way in which they can gain access to quality-assured research publications is to pay up to £20 or more as a ‘pay-per-view’ (PPV) fee in order to read a single journal article.

The issue we are addressing, therefore, is how to expand and improve access to research publications for the benefit of all who have a stake or an interest in research and its results. Barriers to access – particularly when the research is publicly-funded – are increasingly unacceptable in an online world: for such barriers restrict the innovation, growth and other benefits which can flow from research.

The principle that the results of research that has been publicly funded should be freely accessible in the public domain is a compelling one, and fundamentally unanswerable. Effective publication and dissemination is essential to realising that principle, especially for communicating to non-specialists. Improving the flows of the information and knowledge that researchers produce will promote

- ❑ enhanced transparency, openness and accountability, and public engagement with research;
- ❑ closer linkages between research and innovation, with benefits for public policy and services, and for economic growth;
- ❑ improved efficiency in the research process itself, through increases in the amount of information that is readily accessible, reductions in the time spent in finding it, and greater use of the latest tools and services to organise, manipulate and analyse it; and
- ❑ increased returns on the investments made in research, especially the investments from public funds.

These are the motivations behind the growth of the world-wide open access movement. For it is clear that many benefits could result if we were to move world-wide to an open access regime, complete with peer review and with effective search, navigation and other value-added services currently provided by publishers, libraries and others. Moves towards open access have achieved a momentum that we believe will continue. The key policy questions are how to promote and manage the shift in an ordered way which delivers the benefits but minimises the risks. These are particularly important issues for the UK, whose researchers are world-leading in the quality as well as the quantity of the research they produce.

## **2. The current environment.**

Research publishing already shows the influence of open access. There are now three principal interlocking channels for publishing, disseminating and gaining access to research findings.

- ❑ *Subscription-based journals* predominate, published by a wide range of commercial and not-for-profit publishers, including many learned societies. These include the most prestigious and highly-ranked journals, others that play a major role within the disciplines they cover, and yet others that have a more niche market. Many publishers provide ‘big deals’ under which institutions can subscribe to most if not all of their publications on discounted terms. But no single organisation can afford licences for all the 25,000 peer-reviewed journals currently being published; and people who do

not belong to an organisation that can afford large packages of licences have at best very limited access through this channel.

- *Open access journals* turn the subscription-based model on its head: instead of relying on subscription revenues provided by or on behalf of readers, most of them charge a fee to authors, generally known as an article processing or publishing charge (APC)<sup>1</sup>, before an article is published. Access for readers is then free of charge, immediately on publication, and with very few restrictions on use and re-use. The number of journals operating in this way has grown fast in recent years, albeit from a low base.
- *Repositories* do not act as publishers themselves. Rather, they provide access to some version of papers *either* before they are submitted for publication in a journal *or* at some point after they have been published, usually subject to an embargo period. Most universities in the UK, and in many other countries, have established repositories, but the rates at which published papers have been deposited in them so far has been disappointing. In a few areas such as physics, however, subject-based repositories have become an important element in the daily workflow for researchers.

The variations within and the relationships between these three channels are complex. Some subscription-based journals, for instance, operate a hybrid model under which they also offer an open access option for individual articles; and subscription-based journals have developed relationships with some repositories. But the pace of the transition to open access has not been as rapid as many had hoped, for a number of reasons.

First, there are tensions between the interests of key stakeholders in the research communications system. Publishers, whether commercial or not-for-profit, wish to sustain high-quality services, and the revenues that enable them to do so. Funders wish to secure maximum impact for the research they fund, plus value for money. Universities wish to maximise their research income and performance, while bearing down on costs. Researchers themselves wish to see speedy and effective publication and dissemination of research results, but also to secure high impact and credit for the work they have done.

Second, there are potential risks to each of the key groups of players in the transition to open access: rising costs or shrinking revenues, and inability to sustain high-quality services to authors and readers. Most important, there are risks to the intricate ecology of research and communication, and the support that is provided to researchers, enabling them to perform to best standards, under established publishing regimes. Concern about these risks may restrain the development of wider access if it is not managed in a measured way.

Third, research and its communication is a global endeavour. Measures to promote open access need to be similarly international in scope if they are to deliver their full potential. The UK has played a leading role in promoting open access, but there are limits to what the UK can achieve alone. Although researchers in the UK are among the best and most productive in the world, they produce only 6% of the research papers published in journals each year.

Fourth, is the question of cost. Current funding regimes focus on providing access to research literature through libraries, via payments for subscription-based journals. Arrangements to meet the costs of APCs for open access publishing tend to be ad hoc and unsystematic. In the period of transition there are bound to be additional costs as both systems exist side by side.

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<sup>1</sup> Other terms are used, including article publication charge and publication fee. We use the abbreviation APC throughout this report.

All four groups of issues need to be tackled if the transition to open access is to be accelerated in an ordered way.

### **3. Our recommendations**

Our view is that the UK should embrace the transition to open access, and accelerate the process in a measured way which promotes innovation but also what is most valuable in the research communications ecosystem. The process itself will be complex, since as the transition develops over the next few years, no single channel can on its own maximise access to research publications for the greatest number of people.

We therefore recommend that:

- i. a clear policy direction should be set towards support for publication in open access or hybrid journals, funded by APCs, as the main vehicle for the publication of research, especially when it is publicly funded;
- ii. the Research Councils and other public sector bodies funding research in the UK should – following the Wellcome Trust’s initiative in this area but recognizing the specific natures of different funding streams - establish more effective and flexible arrangements to meet the costs of publishing in open access and hybrid journals;
- iii. support for open access publication should be accompanied by policies to minimise restrictions on the rights of use and re-use, especially for non-commercial purposes, and on the ability to use the latest tools and services to organise and manipulate text and other content;
- iv. during the period of transition to open access publishing worldwide, in order to maximise access in the HE and health sectors to journals and articles produced by authors in the UK and from across the world that are not accessible on open access terms, funds should be found to extend and rationalise current licences to cover all the institutions in those sectors;
- v. the current discussions on how to implement the proposal for walk-in access to the majority of journals to be provided in public libraries across the UK should be pursued with vigour, along with an effective publicity and marketing campaign;
- vi. representative bodies for key sectors including central and local Government, voluntary organisations, and businesses, should work together with publishers, learned societies, libraries and others with relevant expertise to consider the terms and costs of licences to provide access to a broad range of relevant content for the benefit of consortia of organisations within their sectors; and how such licences might be funded;
- vii. future discussions and negotiations between universities and publishers (including learned societies) on the pricing of big deals and other subscriptions should take into account the financial implications of the shift to publication in open access and hybrid journals, of extensions to licensing, and the resultant changes in revenues provided to publishers;

- viii. universities, funders, publishers, and learned societies should continue to work together to promote further experimentation in open access publishing for scholarly monographs;
- ix. the infrastructure of subject and institutional repositories should be developed so that they play a valuable role complementary to formal publishing, particularly in providing access to research data and to grey literature, and in digital preservation;
- x. funders' limitations on the length of embargo periods, and on any other restrictions on access to content not published on open access terms, should be considered carefully, to avoid undue risk to valuable journals that are not funded in the main by APCs. Rules should be kept under review in the light of the available evidence as to their likely impact on such journals.

#### **4. What needs to be done**

Implementing our recommendations will require changes in policy and practice by all stakeholders. More broadly, what we propose implies cultural change: a fundamental shift in how research is published and disseminated. A new shared understanding needs to develop of the interlocking roles of the various parties: researchers, policy-makers, funders, university managers, librarians, publishers and other intermediaries.

Our recommendations are presented as a balanced package, so it is critical that they are implemented in a balanced and sustainable way, with continuing close contact and dialogue between representatives of each of the key groups, and regular assessment of key indicators of progress. In the list of key actions below, we indicate where we believe primary responsibility lies.

*Key actions: overall policy and funding arrangements*

- i. Make a clear commitment to support the costs of an innovative and sustainable research communications system, with a clear preference for publication in open access or hybrid journals. (*Government, Research Councils, Funding Councils, universities*)
- ii. Consider how best to fund increases in access during a transition period through all three channels – open access publications, subscriptions, and repositories – and the balance of funding to be provided through additional money from the public purse, by diversion of funds from support of other features of the research process, and by seeking efficiency savings and other reductions in costs from publishers and other intermediaries. (*Government, Research Councils, Funding Councils, universities*)
- iii. Put in place arrangements to gather and analyse reliable, high-quality and agreed indicators of key features of the changing research communications landscape, and to review those indicators and the lessons to be drawn from them. (*Government, Research Councils, Funding Councils, universities, publishers*)
- iv. Keep under review the position of learned societies that rely on publishing revenues to fund their core activities, the speed with which they can change their publishing business models, and the impact on the services they provide to the UK research community. (*Government, Funding Councils, Research Councils, learned societies, publishers*)

- v. Renew efforts to sustain and enhance the UK's role in international discussions on measures to accelerate moves towards open access. (*Government, Research Councils, Funding Councils, universities, publishers*)

*Key actions: publication in open access and hybrid journals*

- vi. Establish effective and flexible mechanisms to enable universities and other research institutions to meet the costs of APCs (*Government, funders*); and efficient arrangements for payment, minimising transaction costs while providing proper accountability (*universities, publishers*).
- vii. Discuss with other funders in the commercial and charitable sectors how best to fund and promote publication in open access and hybrid journals. (*Government*)
- viii. Establish publication funds within individual universities to meet the costs of APCs, making use of dedicated moneys provided by funders for that purpose, as well as other available resources. (*universities*)
- ix. Develop in consultation with academic staff policies and procedures relating to open access publishing and how it is funded. (*universities*) The issues to be considered should include
  - a. whether to promote open access publishing as the principal channel for all research publications
  - b. how much funding should be provided to support the payment of APCs each year, the sources of that funding, and how the funds are to be administered
  - c. how to work together with researchers, and in line with the principles of academic freedom, in making judgements about the potential for publication in journals with different levels not only of status, but of APCs
  - d. how support for publication should be integrated with other aspects of research management, for example the development of research capacity, and support for early-career researchers
  - e. policies relating to payment of APCs when articles are published in collaboration with researchers from other institutions.
- x. Extend the range of open access and hybrid journals, with minimal if any restrictions on rights of use and re-use for non-commercial purposes; and ensure that the metadata relating makes clear articles are accessible on open access terms. (*publishers, learned societies*)
- xi. Provide clear information about the balance between the revenues provided in APCs and in subscriptions. (*publishers, learned societies*)

*Key actions: licensing*

- xii. Rationalise and extend current licence arrangements for the HE and health sectors, so that as many journals as possible are accessible to everyone working or studying in those sectors. (*Government, Funding Councils, universities, publishers, learned societies*)
- xiii. Work together to find ways to reduce the VAT burden on e-journals. (*Government, universities*)

- xiv. Discuss with representative bodies in the public, business and voluntary sectors the feasibility of developing licence agreements that provide access to relevant journals and other content across key parts of those sectors; and possible ways of funding such agreements. (*Government, publishers*).
- xv. Examine the feasibility of providing licensed access to journals for small research-intensive enterprises with which universities have close relationships. (*universities, publishers, JISC Collections*)
- xvi. Continue to work with representatives of public libraries to implement the proposal to provide walk-in access to the majority of journals in public libraries across the UK, and to ensure that the initiative has the maximum impact. (*publishers, British Library*)

*Key actions: repositories*

- xvii. Continue to develop the infrastructure of repositories and enhance their interoperability so that they provide effective routes to access for research publications including reports, working papers and other grey literature, as well as theses and dissertations; a mechanism for enhancing the links between publications and associated research data; and an effective preservation service. (*funders, universities, JISC, publishers*)
- xviii. Consider carefully the balance between the aims of, on the one hand, increasing access, and on the other of avoiding undue risks to the sustainability of subscription-based journals during what is likely to be a lengthy transition to open access. Particular care should be taken about rules relating to embargo periods. Where an appropriate level of dedicated funding is not provided to meet the costs of open access publishing, we believe that it would be unreasonable to require embargo periods of less than twelve months. (*Government, funders, universities*).

## 5. Costs

There will be additional costs during a period of transition which may last for several years; but we cannot be certain about the total costs of all the measures we recommend, particularly with regard to open access publishing. Our estimates are best available evidence at present, including average levels of APCs currently being paid by the Wellcome Trust. But any calculations as to costs for the future depend on a series of assumptions as to

- ❑ the pace of change towards open access publishing, and in particular the extent to which the UK is on average ahead of the rest of the world
- ❑ the average level of APCs as more journals adopt the open access model
- ❑ the number and proportion of articles with overseas as well as UK authors for which UK funders and institutions would be required to pay a full APC
- ❑ the extent to which during the transition universities and other organisations are able to reduce their expenditure on subscriptions even as their expenditure on APCs rises.

We recognise that there is considerable room for debate about assumptions on all these issues; and that variations in them could bring significant changes in our estimates, both upwards and downwards.

Much depends on how quickly the rest of the world moves towards open access. There are good reasons to believe that there is international momentum in this direction, but it is

difficult to predict how fast or comprehensive it will be. It is clearly in the interests of the UK to enhance its role in international discussions on these issues.

Much also depends on levels of APCs and also of the amounts that continue to be paid to publishers in subscriptions, and it is important that in the context of the mixed model we recommend for the medium term, both should be looked at together. Hence the importance of publishers' providing clear information about the balance between the revenues provided in APCs and in subscriptions. But one of the advantages of open access publishing is that it brings greater transparency about the costs, and the price, of publication and dissemination. The measures we recommend will bring greater competition on price as well as the status of the journals in which researchers wish to publish. We therefore expect market competition to intensify, and that universities and funders should be able to use their power as purchasers to bear down on the costs to them both of APCs and of subscriptions.

Taking all these factors into account, our best estimate is that achieving a significant and sustainable increase in access, making best use of all three mechanisms, would require an additional £50-60m a year in expenditure from the HE sector: £38m on publishing in open access journals, £10m on extensions to licences for the HE and health sectors and £3-5m on repositories, plus one-off transition costs of £5m.

The uncertainties we have outlined clearly mean that there is a risk that the costs could be higher than we estimate. But that risk can be managed by slowing the pace of transition. Moreover, the costs are modest in relation to total public expenditure on research (£5.5bn from the Research Councils and Funding Councils alone). Indeed, we believe meeting the costs of transition is essential in order to manage in an ordered way the move from a research communications system which is becoming increasingly unsustainable as a result of the economic, technological and social changes we have highlighted. While any estimates of the benefits that will accrue to the UK economy and society are similarly subject to much uncertainty, it is clear that the benefits will be real and substantial. In short, we believe that the investments necessary to improve the current research communications system will yield significant returns in improving the efficiency of research, and in enhancing its impact for the benefit of everyone in the UK.

## **6. What will change**

The measures we recommend should begin to make a difference quickly but the whole transition process will come to fruition over a number of years.

### *Open access publication*

Our recommendations and the establishment of systematic and flexible arrangements for the payment of APCs will stimulate publishers to provide an open access option in more journals. Most universities will establish funds for the payment of APCs, along with policies and procedures which will in some cases move towards open access as the default mode of publication. That will give universities a greater role in helping researchers to make judgements, in line with academic freedom, about how they publish their work. Different universities may develop different ways of handling this in consultation with their staff. The result will be that a much higher proportion of the publications produced by researchers in the UK will be freely accessible to everyone in the world, with minimal restrictions on their use and re-use.

### *Subscriptions and licences*

Subscription-based journals will remain a key channel for the publication of research results from across the world for some years to come. Implementation of our recommendations will

mean that staff and students in universities and in the health sector will enjoy a much more integrated information environment.

Access to the great majority of journals and articles for walk-in users of public libraries across the UK will make a real and substantial difference to many people and organisations, especially if it is accompanied by effective marketing, training for librarians, and guidance for users. It will also bring a significant enhancement of the role of public libraries in their local communities.

For people and organisations in the public, business and voluntary sectors, exploration of the scope for extensions to licensing for online access will be a step towards wider availability, providing evidence of its value. We hope that some testbeds will be established by consortia of organisations in specific sectors.

### *Repositories*

The further development of repositories will make them better integrated and interoperable, and higher standards of accessibility will bring greater use by both authors and readers. Institutional repositories will develop the roles they perform for their universities, both in providing a showcase for their research and in supporting research information management systems. In the wider scholarly communications sphere, repositories will develop their roles in preserving and providing access to research data, to theses, and to grey literature.

Subject-based repositories will continue to develop refine their roles alongside publishers and their platforms, especially in those areas where such repositories operate effectively already, and have an established position in researchers' regular workflows.

### *Overall*

Implementation of the balanced programme we recommend will mean that more people and organisations in the UK have access to more of the published findings of research than ever before. More research will be accessible immediately upon publication, and free at the point of use. Our recommended programme will accelerate the progress towards a fully open access environment in the UK, and we hope that it will contribute to similar acceleration in the rest of the world. We believe that such movement will bring substantial benefits in transparency and accountability, engagement with research and its findings, closer linkages between research and innovation, and improved efficiency in the research process itself. Our work has shown how representatives of the different stakeholder groups can work together to find ways to achieve those ends.