What flowers can bloom in a green open access landscape? Imagining a future with BitViews.

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Abstract. BitViews is a blockchain application that collects, validates, and aggregates worldwide online usage data of author's approved manuscripts (AAMs) deposited in Open Access Institutional Repositories. It creates a free public ledger of usage events that allows anyone to see which research outputs have been accessed, where, and when, thus providing the raw material to construct discipline- and region-specific non-citation based measures of research impact.

BitViews' short-term implications include:

1.   The re-alignment of journal impact measures (from citations to usage);

2.   Changed patterns in the production of research articles (towards high-usage topics);

3.   Creation of new networks of research collaboration;

4.   Enhanced opportunity for open data sharing.

BitViews' long-term effects are transformative. Because BitViews promotes the "unbundling" of AAMs from published articles, it endows AAMs with independent value. Two disruptive consequences follow: the very concept of APCs is undermined and the conditions are created for the academy to regain ownership of peer review. Relegating commercial publishers to the role of providers of post-AAM services, huge resources will be released. As soon as AAMs are de- coupled from articles, the same process and infrastructure can be applied to research monographs, thereby completing the cycle of Open Access to the whole production of knowledge.

It is a platitude universally acknowledged that there can be no open science without open access. The paper imagines a possible world where one specific form of open access has been achieved (thanks to the BitViews Project) and describes the benefits and challenges that would ensue from unimpeded access not only to peer-reviewed research, but also to a public ledger of online usage data of research outputs.

1. What is the BitViews Project?

The basic concept of BitViews was first published in [1] and further illustrated in [2], but it may be helpful to describe briefly its key features:

1.   A blockchain application (BitViews) collects, validates (using augmented COUNTER criteria), and aggregates on a worldwide basis online usage data of author's approved manuscripts (AAMs) deposited in every Open Access Institutional Repository.

2.   BitViews creates a free public ledger of usage events that allows anyone to see which research outputs have been accessed, where, and when.

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3. The database provides the raw material to construct discipline- and region-specific non-citation based measures of research impact.

One more feature of the BitViews Project needs emphasising, related not to the outcome of the project itself, but rather to the process of achieving success. To the best of my knowledge, BitViews is the first project that deploys a completely decentralised self-financing mechanism owned and managed by University and Research libraries. This aspect of the project requires some explanation, not only because it is vital for the success of the whole enterprise, but also because it has far-reaching implications for scholarly communication more generally.

Up to now every major initiative to promote OA on a global basis has been organised and managed either by a non-profit organisation (e.g., the Budapest OA Initiative and the Open Society Foundation), or by a consortium of leading Universities (e.g., DORA[2]), or by a coalition of research funders (e.g., Plan S). BitViews, instead, is funded on a voluntary basis by University and Research libraries located in the global North through a novel variant of crowdfunding (*conditional crowdfunding*), a two-stage mechanism designed to overcome the free-rider curse, namely, the incentive for beneficiaries of public-good projects to under-contribute, on the expectation that other beneficiaries fund the scheme. [3]

The proposed launch of the project has had to be postponed because of the Covid-19 crisis, with a provisional new launch date of September 2020.

Like most economic, social, and academic activities, the BitViews Project is going to be affected dramatically by the aftermath of the corona virus pandemic. My uneducated guess is that most University and Research librarians will be overwhelmed by the funding and organizational upheaval caused by the financial crisis that will hit universities and research centres on a global scale. Whereas one would hope that the corona virus emergency would have shown the devastating effects of lack of open access on the ability to learn and carry out research, the stark reality is that the most likely outcome would be retrenchment and surrender to the well-organised commercial interests of the academic publishing oligopoly. In fact, there is already anecdotal evidence that many libraries are renewing their journal subscriptions at prices set by large publishing oligopolists.

In spite of the pessimistic outlook, the next sections will examine the short- and long-term effects of a successful BitViews Project.

2. The short-run effects of BitViews

The first immediate outcome of the BitViews Project is the availability of a new and powerful database: the public ledger of online usage events generated by BitViews. This research resource will enable sociologists of science and culture (as well as individual researchers and indeed anyone interested in research) to track the impact and spread of individual articles, sets of articles, any given author's articles, etc. over time and across geographical areas.

This wealth of data will, in turn, provide the raw material to compute discipline- and geography-specific metrics of *non-citation* research impact.

An exciting possible development in the research environment nurtured by BitViews concerns the creation of new networks of research collaboration. In its initial release, BitViews will set privacy controls to their highest setting. Specifically, BitViews records

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[2] https://sfdora.org/read/ .

[3] In stage 1 participating libraries indicate the *maximum* pledge they are prepared to contribute to fund the US$400,000 target (this is the set-up cost of the project); a pledge is not a binding commitment, but a mere indication of interest – no funds are disbursed. On the closing date of this *pledging* phase, all pledges are summed up. If the total is less than the target, the project is closed. If total pledges exceed the target, in stage 2 participating libraries contribute *pro rata* (e.g., if total pledges amount to US$800,000, each library pays in only half of its maximum pledge). The more libraries participate and pledge, the lower their actual contribution.

the DOI of the viewed/downloaded AAM, the time of access, and the generic location, thereby protecting the identity of the individual accessing the research. There are circumstances in which the user herself may wish to set her own privacy settings at a lower level: for example, she may want to disclose her identity/email address only to the author(s) of the accessed AAM or, more widely, also to other users who have accessed or will access the same AAM. Indeed, it is easy to imagine that in later releases the interface with the BitViews ledger may include customizable privacy settings, allowing the creation of new research networks by areas of interests, geographical location, etc. At an even later stage, one can imagine similar customizable settings to be applied for post-publication peer-review, allowing (identified) users to submit comments, suggestions for further/alternative readings, etc. A further development enabled by the decentralised and automated nature of BitViews would be to the preservation of open research data.

The second implication of BitViews will be a re-alignment of the research impact of journals. For example, in [2] we analysed one specific discipline (emergency medicine) for one specific region (Africa) for the period 2014 to mid-2019, by counting all articles by at least one author with an African affiliation as recorded in the Scopus/SciVal database. If citations are replaced by online views/downloads, top-tier journals (mainly paywalled) see their rankings drop precipitously and, conversely, mainly Open Access journals soar in the rankings. But, far more important than a re-assessment of *already produced* research is the effect that BitViews can have on the *production of new knowledge*. This effect is often neglected or misunderstood: consider, as an extreme case, a researcher interested in studying and producing new knowledge that is especially relevant to a region (say, sub-Saharan Africa) with a low peer-reviewed publication rate. This means that, even if the proposed article widely were read and appreciated by the target readership it would leave virtually no trace in terms of citations and thus would garner no academic recognition for our researcher who, in all probability would concentrate her research on different and more highly cited topics. Notice that this distortion of research effort is not changed in any way if our research were to be published in an open access journal. If, on the other hand, there were a credible footprint of non-citation impact, as provided by the BitViews public ledger of online usage, there would be an incentive to carry out research on high-usage, low-"citability" topics.

Notice that all the benefits described above flow *both* from having unrestricted access to AAMs *and* from having a validated record of online usage data, not from the published article.

At the risk of stating the obvious, the emphasis on AAMs and thus on *academic journals* at the core of the BitViews Project is directly relevant to those disciplines that attach special value to journal articles, namely, broadly speaking to STM and some social sciences (especially economics). Other disciplines, that value the research monograph as the main index of research activity (e.g., history), may appear to be peripheral to a project focused on AAM. But this would be the wrong inference, because, as explained in the next section, the long-term effects of BitViews and particularly the reclaiming of peer review by the academy, would be of direct benefit to monograph-centred disciplines.

Before describing the long-term effects of the BitViews Project, it is crucial to appreciate the change in *incentives* brought about by the mere existence of the project. Even the most enthusiastic supporter of OA would agree that with the exceptions of very isolated cases authors remain as unwilling to implement OA as they were at the time of the Budapest OA Initiative. The reason is painfully simple: as soon as my submission has been peer-reviewed and accepted for publication in a form that increases my esteem and

recognition amongst my peers (i.e., in a high-impact journal where it can garner citations), I move on to my next research paper. No need whatsoever to worry about open access[4].

The inescapable fact is that as long as the *citation* (an object attached to the publisher-owned version of record, VoR) remains the main currency of academic recognition and esteem, authors will have no incentive to deposit their AAMs. However, if AAMs could be given *independent* value, then authors would have an incentive to promote them. Of course, AAMs have a built-in substantial advantage over the published article in so far as they have a potentially much wider reach than paywalled VoRs. What advocates for open access have consistently failed to realise is that the mere prospect of a wider readership does not constitute a strong enough incentive for authors to deposit their AAMs as long as there are no reliable data to measure the reach of AAMs. The BitViews Project, by collecting, validating, and disseminating online usage data of AAMs provides the missing incentive.

It is easy to underestimate the long-term disruptive potential of the BitViews Project, as seen from a short-term perspective: after all, it does not require any wholesale changes in the way authors, referees, editors, and publishers operate. According to SHERPA/RoMEO[5], as of now, 80% of accepted articles could be legally deposited as AAMs in open access repositories. (I would add that the remainder would also follow suit if their authors requested permission from their publishers or proceeded to deposit regardless, knowing that it would take a brave publisher to demand the taking down of an AAM.) Therefore, a substantial step towards green OA would be taken if the BitViews Project could be implemented, as it provides authors with the missing incentive to deposit their AAMs, without disrupting in any way the traditional workflow of academic publishing. Important as universal green open access is, it does not represent the only or even the main objective of the BitViews Project, as explained in the next section.

A key difference between the BitViews Project and other initiatives, such as Open Review[6], PubFair[7], or the "De-coupled Journal" [4], that take a radical perspective aimed at altering the very foundations of the current academic publishing mechanism, is that the latter envisage a root-and-branch reform of academic publishing *before* the objective of universal open access is achieved, whereas BitViews on the one hand attains open access while working within the confines of the status quo while on the other hand creates the pre-conditions for flipping the current dysfunctional publishing model to a more efficient and fairer one.

3. Long-term effects of the BitViews Project

This section attempts to forecast a possible direction of travel for academic journal publishing that disrupts the current unholy alliance of commercial publishers, learned societies, un-coordinated librarians, and citation-focused academics.

The theoretical background of the BitViews is the hypothesis that the fundamental obstacle to achieving a more efficient and fairer mechanism for producing and disseminating peer-review research is the coupling together of the outcome of peer review (the AAM) with post-AAM services into a single commodity – the published article (the VoR). Decoupling the two will have a truly transformative effect on academic publishing.

The implicit social contract between the academy and publishers whereby the former would let the latter organise both the peer review and the (hard copy) publication of

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[4] According to [3] authors attach to open access a weight even lower than for pre-prints (i.e., non peer-reviewed outputs).
[5] https://sherpa.ac.uk/projects/sherparomeo.html .
[6] https://www.fosteropenscience.eu/about#theproject.
[7] Tony Ross-Hellauer *et al.* "A Framework for Sustainable, Distributed, Open Science Publishing Services", 2019, https://comments.coar-repositories.org/wp-content/uploads/2019/09/Pubfair_-A-Framework-for-Sustainable-Distributed-Open-Science-Publishing-Services.pdf .

research papers basically broke down in the 80s and 90s when a handful of commercial publishers exploited the quasi-monopoly position of each (high-impact) journal and charged libraries subscription prices vastly above cost to the exclusive benefit of their own shareholders.

The time has come for the academy to realise that huge savings and much increased efficiency can flow from finally dissolving the current one-sided contract with publishers and from reclaiming control and ownership of the whole peer review process. It is worth stressing that a project such as BitViews, by giving additional and independent value to AAMs (as opposed to VoRs), can play a significant, if indirect, role in reshaping the relationship between peer review and academic publishing as explained below.

A rational and efficient mechanism for the production and dissemination of peer-reviewed research that exploits the comparative advantage of both the academy and of commercial publishers must necessarily involve two separate stages.

1. Peer review stage: with one essential difference, this stage involves no change compared with the current situation: referees will keep on refereeing (for free), editors will keep making editorial decisions (mainly for free), authors of accepted papers will keep receiving their AAMs (mandated to be deposited in one or more IRs). The one essential difference with the *status quo* is that the small fixed costs of peer review will be incurred by the academy, thereby retaining control (and ownership) of the whole process up to, and including, the production of AAMs. Notice that universal open access to the *content* of peer-reviewed research is achieved by default.

2. Post peer review stage: at the end of the first stage the academy is the owner of a product (the AAM) whose value can be increased by the provision of additional services in which commercial publishers have a distinct comparative advantage, from printing and distributing in hard copy to referencing services, etc. Notice the inversion of roles: the academy would switch from being a passive (and exploited) consumer of published articles to supplier of AAMs and correspondingly publishers would have to compete with each other for the right to provide additional services that augment the value of AAMs.

It is important not to repeat the same mistakes that have led to the glacial progress of open access with the re-appropriation of peer review by the academy: simply defining a destination with attractive facilities without spelling out the route(s) that can lead to it is a recipe for stalemate. And, yet again, the issue of providing appropriate *individual* incentives to the key players is going to be crucial for the success of the transition.

What follows is a preliminary account of how the many stakeholders in the academic publishing environment can be induced to take beneficial actions:

University administrators and executives: the substantial savings in subscription and APCs that would accompany the transfer of ownership of the peer review process from publishers to the academy would provide university finance directors with the wherewithal not only to accommodate the relocation and fixed costs of editorial offices, but also to provide financial and career benefits to editors and editorial boards, thereby facilitating the transfer. Even by the most conservative of estimates [5], the transfer of ownership of peer review from publishers to the academy would generate a substantial surplus, which, in turn, would provide the main motivation for University administrators to initiate and manage the switch.

Learned societies and associations: it is no secret that some learned societies and associations have failed over the years to take a robust position vis-à-vis publishers to ensure the most efficient and fairest mechanism to produce and disseminate knowledge, effectively taking a (small) share of the publishers' super-normal profits to fund their non-

publishing activities. Under the reformed mechanism sketched here they would still be able to do so, but the income stream would come from the cost savings resulting from the transition, from the sale to publishers of the right to add value to AAMs, and from membership fees.

Editors, editorial board members, and referees: currently the main agents in the peer review cycle are not remunerated at all or earn relatively small honoraria. Under a reformed mechanism, their essential contribution to the integrity of science and scholarship can be rewarded both financially and in terms of peer recognition and academic advancement. Notice also that an academy-owned peer review mechanism is better suited to accommodate discipline-specific features of peer review. For example, disciplines and sub-disciplines that currently struggle to receive high-quality and timely reports from referees could introduce appropriate incentives (either financial or reputational) and would be able to levy income-graduated submission fees.

Research funders: under the reformed mechanism advocated for here, research funders will no longer have to pay APCs and green open access would not have to be mandated (as it would happen by design). The very large resource savings thus generated can be better directed to sustain the peer review infrastructure and, for an initial period, to cover the costs of switching the ownership and control of peer review from publishers to the academy.

Foundations/charities with OA missions: I have not been able to collect data on the resources that foundations/charities with OA missions have spent on OA in the last 20 years or so, but I would not be surprised if they amounted to hundreds of millions of US$ if not more. While some of their efforts have been transformational, I suspect that for the rest cost-benefit analyses would be rather disappointing. In the new landscape of academy-owned peer review, targeted philanthropic grants could play a fundamental role in ensuring a speedy and successful transition. In particular, OA foundations and charities should explode the myth that the online infrastructure supporting peer review (e.g., manuscript processing software) is expensive to build and to maintain. Of course, as long as it is owned by private equity companies[8] and used as a cash cow, there is a strong incentive to gold-plate it and charge correspondingly inflated prices. Instead, foundations and charities could commission and release as open-source discipline-specific manuscript processing software at a fraction of the cost currently burdening the academy. More generally they could facilitate the one-off costs of flipping peer review from publisher- to academy-ownership.

The transfer of ownership and control of peer review may take different forms and at different speeds, depending on the specifics of the journals affected:

(i) Journals published commercially on behalf of learned societies can switch to academy-ownership at the next contract renewal date;
(ii) Editors and editorial boards can migrate from publisher-owned journals to academy-owned ones;
(iii) New academy-owned journals can be set up as direct competitors (i.e., upholding the same or higher acceptance standards) of publisher-owned ones.

It would be naïve if not irresponsible to underplay the likely response by commercial publishers to a reform that would substantially reduce their market power and their super-normal profits. Similarly, those learned societies who benefit from the current arrangement can be expected to oppose any change that challenges the *status quo*. The power of

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[8] ScholarOne, a leading manuscript processing package, is produced by Clarivate, owned since 2016 by the Canadian private equity firm Onex Corp and by Baring Private Equity Asia.

attraction of high-impact, long-established journals will have to be countered by an equally strong centrifugal force.

A key role is going to played, again, by the main direct beneficiaries of the switch of ownership of peer review from the publishers to the academy, namely the organizations (Universities, research funders, charities) that foot the current bill of over US$10 billion p.a. in subscription charges and APCs (according to [5, p. 22], citing [6]). The range of measures that these organizations could take to facilitate the switch is wide and would include:

(i)   Positively discriminating in favour of academy-owned journals (notice that there would be no dilution of peer review standards, as these would be set, monitored, and enforced by the academy). For example, for an initial period of 3-5 years, articles published in new academy-owned journals could be given double weight compared to their commercially-owned counterparts.

(ii)   For an initial period of 3-5 years, research funders could add a premium to articles published in academy-owned journals to be paid directly to these journals.

(iii)   DORA-endorsing Universities are empowered to make judgements about the quality of published articles based not on impact-factor metrics, but on the public and transparent peer review criteria of academy-owned journals.

Historians of scientific publishing will recognize the similarities between the two-phase reform proposed in this paper and the relationship between learned societies and publishers/printers that had endured since Oldenburg's days up to the 1950s. Then the peer review process was firmly in the hands of learned societies who would put to tender (admittedly not very frequently) the contracts to produce their printed journals. The quality of peer review was guaranteed by the admission criteria for membership of the society (being male, white, and upper middle class conferred a distinct advantage – see [7]). Of course, in the online age there is no reason to repeat the mistakes of the past and every reason to enforce rules and conventions ensuring that peer review is carried out in ways that do not discriminate on grounds of gender, age, affiliation, nationality, etc.

It is easy to see that this more rational and efficient mechanism would release a substantial amount of resources currently being wasted on gold-plated publishing services or being transferred to the shareholders of commercial publishers. Even a small fraction of the savings thus gained would be sufficient to fund the switch from publisher- to academy-ownership of the peer review process.

Although my emphasis when describing the long-run effects of BitViews has focused on journals, it is clear that the implications of the academy reclaiming the whole process of peer review are even more far-reaching for monograph-centred disciplines, as they do not have to overcome the obstacles posed by publisher-owned established journal titles. The very same academy-owned infrastructure for journal articles peer review can be used for research monographs, which would enjoy the same advantages of academy-ownership as AAMs: transparent peer review, open access, validated online usage data and hence trackability of use, etc. University presses and learned societies[9] would play a critical role in organising peer review and in redesigning incentives for authors and reviewers.

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[9] The difficulties for learned societies involved in the transition from publisher support to academy control should not be underplayed. A radical change in mindset would be required to grasp the opportunities provided by reclaiming ownership of peer review and, in the case of monographs, open access online publishing. An illustrative example of the hostility towards open access even for journal articles is provided by the president of the Royal Historical Society who has recently declared to be "skeptical about the utility of global dissemination of the author accepted manuscript (AAM) via university repositories" and thus willing to sacrifice the access to

4. Conclusions

The BitViews Project can be viewed as a benign Trojan horse: in the short run it provides authors of academic articles with the hitherto missing incentive to deposit the *content* of their research (embodied in the AAM) on institutional repositories thereby finally achieving the objective of universal open access. This would be attained without requiring any other change from any of the stakeholders of academic publishing: referees would keep refereeing, editors, editing, publishers charging often extortionate prices, librarians complaining about extortionate journal prices, and learned societies living off the crumbs kindly dispensed by the academic publishing oligopolists.

In the long run, however, the seed planted by the BitViews Project – in the form of the de-coupling of the AAM from the published article – may blossom into an altogether different life-form, a decentralised, academy-owned and academy-controlled ecosystem. For the new ecosystem to be established and prosper, of course, it will be necessary for the direct beneficiaries of the new regime, namely, University managers, librarians, and public and private research funders, to take charge of the transition.

The post Covid-19 squeeze on University finances and hence on academic publishing budgets will bring to the sharpest relief the choice facing research and University funders: either to carry on with a business-as-usual model (but with more cuts and even less open access) or to grasp the unique opportunity to reclaim for the academy the whole peer review process and the open sharing of research outputs free from publisher-imposed paywalls.

The outcome of the funding phase of the BitViews Project (requiring University and Research libraries in the global North to fund collectively a very inexpensive initiative with potentially high benefits) can be regarded as a canary in the publishing mine: failure will portend a period of retreat before the platoons of commercial publishers, whereas success may shine a ray of hope for a long overdue reform of the whole academic publishing industry.

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knowledge for countless readers because AAMs "lack stable pagination" (Margot Finn, President of the Royal Historical Society, interviewed by Karin Wulf in *The Scholarly Kitchen,* 21 Nov. 2019, https://scholarlykitchen.sspnet.org/2019/11/21/historians-respond-to-plan-s-open-access-vs-oa-policies-redux/?informz=1).

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