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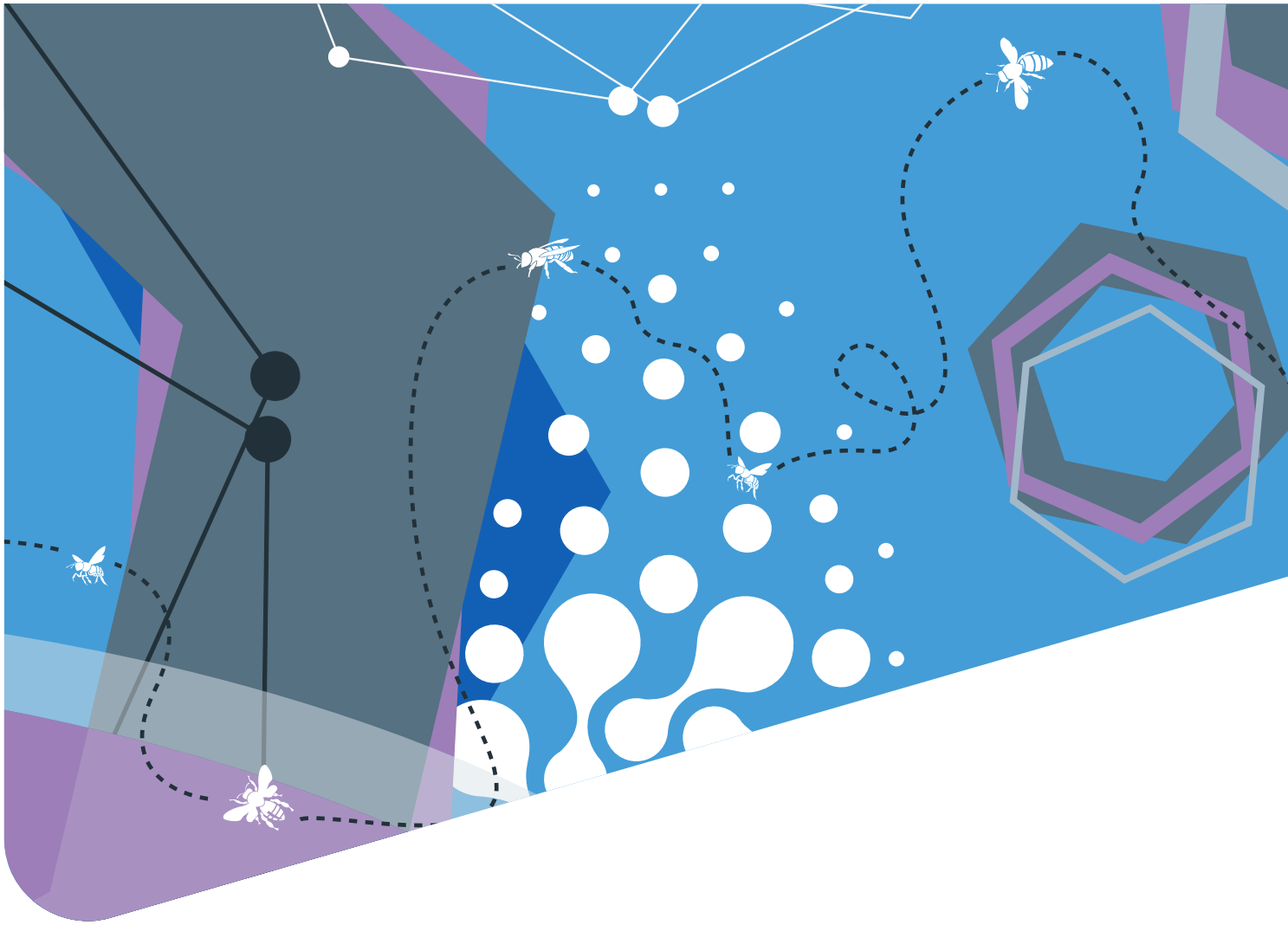


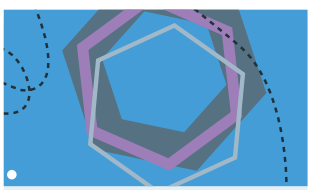
Illustration inspired by the work of Jean-Claude Bradley

Open Research

‘APCS IN THE WILD’: EXPLORING FUNDING STREAMS FOR AN ACCELERATED TRANSITION TO OPEN ACCESS

Whitepaper

ADVANCING DISCOVERY



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March 2020

This whitepaper and associated data has been made openly available in the figshare repository.

Access whitepaper:
https://doi.org/10.6084/m9.figshare.11988123.v4

Access associated data:
https://doi.org/10.6084/m9.figshare.11955687.v1

Foreword

At Springer Nature we are committed to enabling a faster transition to open access (OA), with a focus on working through the problems that limit this transition. Our mission is to advance discovery, and open research, including immediate OA, plays an important part.

We have been driving change and innovation in open research for twenty years. Back in the earliest days of BMC, understanding how OA could be funded and supported in a sustainable way was very much at the heart of our development. We worked closely with funders and institutions, pioneering the now familiar APC model that has enabled immediate access, extensive reuse, and high visibility of important research content around the world. We were the first to develop a transformative agreement in 2014, working in partnership with the Association of Universities in the Netherlands to enable researchers the opportunity to publish OA with their costs covered by a national licence. And we have continued to develop these agreements internationally, with ten currently in place and many more under discussion.[1]

These transformative agreements have been a major contribution to the growth of OA at Springer Nature. As we demonstrated in a UK case study, it is possible for such deals to truly transform the research landscape: in 2017, 77% of all Springer Nature publications with UK corresponding authors were published via Gold OA, compared with a 30% average uptake of OA globally.[2] Similar growth is evident across all our most established transformative agreements.

So what is needed to build on the momentum we have seen in these regions and to extend the reach of OA agreements globally? As we've written elsewhere, a collaborative effort is critical in effecting a transition to OA.[3] One particular aspect of this, which is the focus of our whitepaper, is the need to better understand and consolidate multiple funding streams for OA payment. Our whitepaper highlights the challenges in currently monitoring payments, looking to our own author feedback to demonstrate that the sources of OA funding are often complex. A high number of APCs are funded through sources that are referred to as 'in the wild', being harder for an institution or funder to monitor, track or collate. Our whitepaper also explores the scope to enable better monitoring, and the opportunities this presents, through a series of institutional interviews.

Our findings indicate there is a real opportunity to accelerate a transition to OA if all OA funding streams, including those 'in the wild', are understood, effective monitoring introduced, and by then harnessing a complex set of funding sources.

There are some important recommendations in this whitepaper for publishers also; notably in our responsibility to ensure our workflows and reporting make

Carrie Webster, VP Open Access, Springer Nature

A high number of APCs are funded through sources that are 'in the wild', being harder for an institution or funder to monitor or track

1. Springer Nature. Institutional Open Access Agreements. Available at: https://www.springernature.com/gp/open-research/institutional-agreements [Accessed February 29, 2020].
2. Lucraft, M.; Calder, C.; Pyne, R.; Monaghan, J.; Spinka, V. 2018. Gold Open Access in the UK: Springer Nature's Transition. Available at: https://doi.org/10.6084/m9.figshare.6230813 [Accessed February 29, 2020].
3. Winter, S. 2020. What is needed to drive the OA transition in 2020? UKSG Newsletter 461. Available at: https://www.uksg.org/newsletter/uksg-enews-461/what-needed-drive-oa-transition-2020 [Accessed February 29, 2020].

choosing and supporting OA as easy as possible for authors, institutions and funders. At Springer Nature we are currently investing substantially in the development of our APC payment systems to help meet this need by building improved workflows that will increase our capability to provide detailed metadata to institutions during and after APC payments and publication. Our systems for handling centralised consortial agreements, used for our transformative Compact agreements, have been recognised as yielding greater efficiencies for authors and institutions alike and will play a key role as we expand our range of agreements to new consortia and funders. With further development we will drive similar improvements in handling and monitoring of payments for individual APCs too.

We are proud of the role we have played in shaping both OA business models and discussion. Together, publishers, funders, institutions and the whole scholarly communications industry have a part to play in enabling a successful OA transition. An immediate action for us following this initial research is to validate these findings and broaden our understanding of institutional monitoring and tracking of APC payments. For that reason, we intend to collect and share further insights from institutions on the barriers and enablers for APC monitoring, and encourage feedback on the models this whitepaper has identified.

Executive Summary

To accelerate a transition to open access (OA), better understanding is needed of what is currently a fragmented and varied funding landscape. This whitepaper explores data from Springer Nature authors on the source of article processing charge (APC) funding, along with feedback from institutional interviews to facilitate a greater understanding of where funding for APCs originates and how these sources are being used. It further examines what is required for institutions and funders to monitor and track this spend.

Accelerating the transition to OA will involve bringing together multiple different funding streams, as well as tackling complex questions regarding redistribution of existing funds.

Developments in OA business models and infrastructure are improving the ability to monitor article OA status and spending, a step that is crucial to enabling institutions and research funders to make informed decisions about funding for Gold OA, in particular with regard to agreements with publishers (including transformative and fully OA agreements). However, there are still many APCs 'in the wild', in other words payments that are harder to monitor and that institutions and funders may be unaware of. This report explores the scale of 'wild' funding streams that remain for the most part unmonitored but which could be harnessed to accelerate a transition to OA.

Accelerating the transition to OA will involve bringing together multiple different funding streams, as well as tackling complex questions regarding redistribution of existing funds

Key findings:

- **APC funding is complex. Authors use a wide range of funding sources, often in combination**
  - **A survey of 1,014 Springer Nature authors (part one of this whitepaper) indicates that there is no dominant source of APC funding for authors publishing in either fully OA or hybrid journals. Authors are drawing on research funders, institutions, publisher agreements, and other sources (e.g. personal funds) to finance APC payments**
  - **Nearly half of respondents (47% of fully OA authors, 44% of hybrid OA authors) combine two or more of these main sources of funding in order to cover their APC**
- **Monitoring is a challenge as many APCs are still 'in the wild', particularly for fully OA journals**
  - **There is wide variation in the ability of institutions to track APCs, according to interviews with sixteen institutions (part two of this whitepaper)**
    - Although many (14/16) had workflows in place to track publications from the institution, far fewer were tracking APC payments. This is particularly true for author payments made 'in the wild', i.e. outside of funds centrally managed by the library or institution
    - While one interviewee estimated they track approximately 95% of all APCs, another stated that the vast majority of APC payments from authors from their university fell outside of their range
    - For a number of interviewees, the monitoring of APC payments is noted as being a "bureaucratic headache", with resourcing within the library the biggest obstacle

- **27% of Springer Nature authors surveyed used only 'wild' funding sources for their APC, and a further 50% combined an APC funding source 'in the wild' with funds from more easily monitored sources**
  - The figure is even higher for fully OA Springer Nature authors:
    - 29% used only APC funding sources 'in the wild'
    - 54% used a combination of 'wild' and more easily monitored APC funding sources
    - 17% used no APC funding sources 'in the wild'
  - For Springer Nature hybrid authors:
    - 18% used only APC funding sources 'in the wild'
    - 31% used a combination of wild and more easily monitored APC funding sources
    - 51% used no APC funding sources 'in the wild'
  - The levels of APCs 'in the wild' are expected to be even higher among hybrid authors as a whole, since Springer Nature's sample includes over a third of hybrid respondents whose APCs were supported by transformative agreements via Springer Compact
- **The level of APC 'wildness' also varies regionally, as different OA policies and funding mechanisms have created different landscapes**
  - Among fully OA authors surveyed, the UK had the lowest levels of APCs 'in the wild', with 50% using funds 'in the wild', either alone (12.5%) or in combination with other funds (37.5%). This reflects the greater availability of dedicated APC funding streams from institutions and research funders
  - By contrast, 92% of fully OA authors in North America were using APC funding sources 'in the wild', either alone (35%) or in combination with other funds (57%)
  - For China the proportions are also high with 96% of fully OA authors using APC funding sources 'in the wild', either alone (29%) or in combination with other funds (67%)
- **50% of fully OA and hybrid OA authors surveyed were not confident that their institution would be able to centrally monitor their APC**
  - An additional 8% of fully OA authors and 3% of hybrid OA authors thought it would be impossible for their institution to centrally monitor their APC

- **To support the OA transition institutions need a more comprehensive view of APC funding sources**
  - **Some institutions have identified workflows that enable monitoring**
    - Methods have included institutional policies for authors to contact the library on acceptance of their article, or financial workflows, such as identification of payments via accounting codes
  - **Analysis of the total costs of APC payments has in some cases enabled institutions to propose new centralised OA funding programmes**
    - One interviewee estimated it would be able to cover 75% of all payments made in future
  - **Publisher OA agreements offer a means to centralise APCs, reducing the OA funding and monitoring administrative burden**
    - Among institutions interviewed, transformative agreements were acknowledged to reduce the administrative burden for institutions by centralising payments

Over a quarter of authors surveyed used only 'wild' funding sources for their APC

- **Authors' use of funds from outside of the library budget (other institutional funds or from research funders) demonstrates the opportunity for publisher OA agreements to consolidate multiple sources, as has been the case for some existing Springer Nature agreements**
  - 40% of hybrid OA authors drew on funds from their research funder to cover their APC, while for fully OA authors the figure is even higher at 59%
  - Authors may also be using ad hoc institutional budgets that are not seen by the library or OA team, e.g. 29% of fully OA authors and 18% of hybrid OA authors drew on funds from their institution that were not dedicated to OA, and not part of publisher agreements

Further research is needed to identify APC monitoring blockers and enablers. Building on this report, Springer Nature will conduct an institutional survey with the aim of gaining a more global and representative picture of institutional activity around APC monitoring, and the blockers and enablers that affect success. By putting in place mechanisms for better and more comprehensive monitoring of APC payments, funders and institutions can drive forwards a faster transition to OA, harnessing these funding streams to finance OA at scale.

Introduction: the challenges in APC monitoring and tracking

Transitioning budgets to OA

In 2016, the OA2020 declaration called for a transformation of the current subscription system,[4] building on a calculation by Max Planck Digital Library that suggested library budgets for subscription journals could collectively support the costs of Gold OA publications.[5] Whilst there have been varied opinions on the methodology used for this calculation, one challenge that has been raised concerns the position of research-intensive institutions for whom the total costs for APCs would exceed the current library journal budgets, meaning that a combination of funding sources (including research grant funds) would be necessary.[6]

Transformative agreements between consortia and publishers are one method that has been employed to transition budgets to OA. These transition existing subscriptions into agreements covering both the costs of publishing institutions' research outputs via the Gold OA route, and also reading access to subscription content in the publisher's portfolio. Springer Nature has been a pioneer in this space, signing the first transformative agreement (often also referred to as 'read and publish' or RAP agreements) with the VSNU consortium in the Netherlands in 2014, followed by a series of further agreements, numbering ten to date.[7] Transformative agreements are supported by the cOAlition S funding bodies – key advocates for a full OA transition – as a means of driving progress towards full OA.[8] These agreements generally focus on transforming articles within hybrid journals where in many cases institutions are able to make use of existing subscription budgets to fund the costs of transition. Transformative agreements have been demonstrated to be hugely successful in transitioning content to OA,[9] and in particular in driving OA uptake in hybrid journals, notably in disciplines where previously there had been little OA publishing.[10]

For fully OA journals however, there are no existing subscription budgets to transform. Instead, many institutions have created dedicated institutional APC funds, but institutions and consortia must source funds for these from additional budgets. Literature shows concern from institutions about the diversion of library funds – which are already overstretched – to cover APCs.[11] Some commentary has suggested that institutions would be unable to cope with the burden of costs passed to them.[12] Some of this burden has been addressed via centralising payments through agreements, as has existed in the form of institutional OA memberships, and more recently through pure OA agreements. However in order to create funds for this, institutions need a greater understanding of what researchers are spending on OA from other sources, and to consolidate these budgets.

The role of research funders

One option is to look to research funders to contribute given that many research funding organisations have explicitly allowed the use of their research grants for APC payments.[13] An example of this is the approach the Swedish Bibsam consortium has

The need for universities to have a complete overview of the costs involved in subscriptions and OA publishing is emphasized within the OA movement

4. OA2020, 2016. OA2020 Expression of Interest. Available at: https://oa2020.org/mission/ [Accessed March 4, 2020].
5. Schimmer, R., Geschuhn, K.K. & Vogler, A., 2015. Disrupting the subscription journals' business model for the necessary large-scale transformation to open access. Available at: http://dx.doi.org/10.17617/1.3 [Accessed March 4, 2020].
6. Smith, M., Anderson, I., Bjork, B., McCabe, M., Solomon, D., Tananbaum, G., Tenopir, C., Willmott, M. 2016. Pay It Forward: Investigating a Sustainable Model of Open Access Article Processing Charges for Large North American Research Institutions. Available at: https://escholarship.org/uc/item/8326n305 [Accessed March 4, 2020]. Schönfelder, N., 2019. Transformationsrechnung: Mittelbedarf für Open Access an ausgewählten deutschen Universitäten und Forschungseinrichtungen. Universitätsbibliothek. Available at: https://doi.org/10.4119/unibi/2937971 [Accessed March 4, 2020].
7. Springer, 2014. Springer and Dutch universities reach wide-ranging agreement on access. Available at: https://www.springer.com/gp/about-springer/media/press-releases/corporate/springer-and-dutch-universities-reach-wide-ranging-agreement-on-access/40938 [Accessed March 4, 2020].
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taken in their recent agreement with Springer Nature and four Swedish national funders, under which costs for OA publishing in fully OA and hybrid journals are shared.[14] The situation with regard to research funders differs starkly across countries, however – for example:

- In the UK as well as in continental Europe, many research funding organisations are part of cOAlition S and support the transition towards immediate OA. In some countries research funders do financially contribute to transformative agreements that are concluded by national consortia, thereby sharing the financial burden with libraries[15]
- In China, the major research funding organisations at the national level are the Ministry of Science and Technology and the National Natural Science Foundation of China (NSFC). The NSFC funds about 70% of the Chinese research articles published in international journals, and has an OA policy with a 12 month embargo allowed[16]. These major funders allow the use of research grants for APC payments, but have not established dedicated OA funding streams
- In Australia, the two main research funders – the Australian Research Council and the National Health and Medical Research Council (NHMRC) – support the transition to OA with requirements for Green OA. The Council of Australian University Librarians has signed the statement of support for Plan S, but the research funders are not co-signatories of the statement of support, because of financial concerns with regard to APCs. Also, there is some resistance in allowing grant holders to pay APCs (e.g. the NHMRC does not allow initial research budgets to include publication or OA costs, although authors are allowed to use remaining grant funds[17])
- In the USA, the federal funding agencies allow researchers to use their research grants for APC payments. However, there are many other regional and private research funding organisations with different rules and conditions. The decentralised setup of the research landscape in the USA makes it important for libraries to find ways to share some of the financial burden of transformative agreements with research funders. The University of California has suggested one approach for co-funding APCs with research funders under its model transformative agreement proposal[18]

Bringing together these funds under a combined OA agreement requires an understanding of existing levels and sources of APC funding, and this can be a complex landscape.

APC funding types

Since the early 2000s, the Gold OA market has grown considerably.[19] At the time of writing, more than 3,800 fully OA Gold Journals are listed in DOAJ with an APC-based business model.[20] Analysis indicates that between 24%[21] and 30%[22] of articles published in 2018 were made available via the immediate Gold OA route in fully OA or hybrid journals. For many of these articles an APC will have been paid, while others will have had Gold OA costs covered by other means such as transformative agreements or sponsorship of journals (Diamond OA).

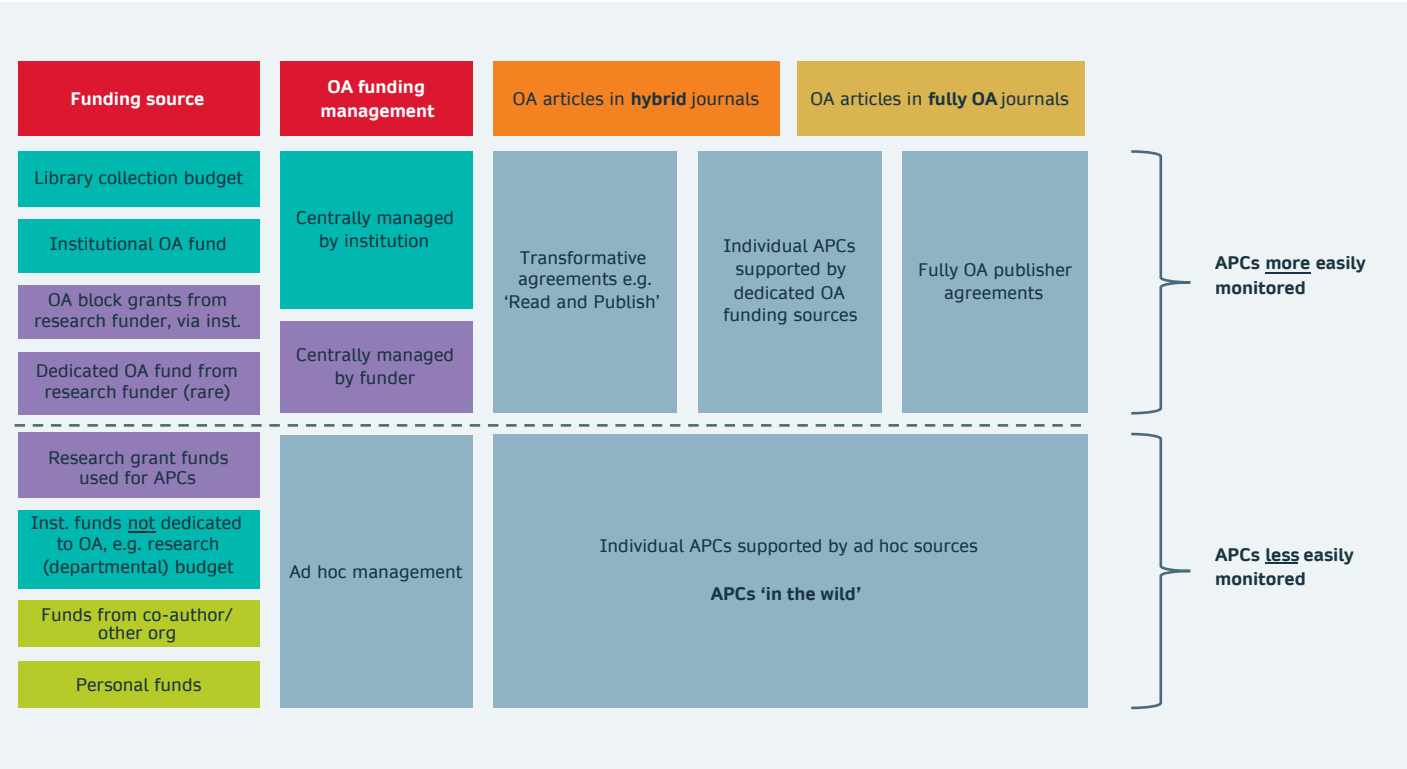
Authors cover the costs of their APCs from a variety of sources. At a basic level these can be broadly split into those funded by their institution, and those by their research funder (if they have outside funding), but there is much greater complexity once we examine the multiple routes through which institutions and funders may distribute these funds (see Figure 1).

9. Springer Nature, 2017. Springer Nature is delivering on open access and calls for continued partnership. Available at: https://group.springernature.com/gp/group/media/press-releases/springer-nature-is-delivering-on-open-access-and-calls-for-conti/15152888 [Accessed March 4, 2020]
10. Lucraft. Gold Open Access in the UK: Springer Nature's Transition.
11. Pinfield, S. & Middleton, C., 2016. Researchers' Adoption of an Institutional Central Fund for Open-Access Article-Processing Charges. SAGE Open, 6(1). Available at: https://doi.org/10.1177/2158244015625447. [Accessed February 29, 2020].
12. Kember, S., 2019. Who pays the price for Open Access?. WonkHE. Available at: https://wonkhe.com/blogs/who-pays-the-price-for-open-access/ [Accessed March 4, 2020].
13. Sherpa Juliet lists 149 funder OA policies, of which 70% requires depositing and 31% requires OA publishing. Sherpa Juliet Statistics. Available at: https://v2.sherpa.ac.uk/view/funder_visualisations/1.html [Accessed November 17, 2019].
14. Springer Nature. 2019. Springer Nature accelerates its transformative journey with the signing of landmark pure OA deal. Available at: https://group.springernature.com/in/group/media/press-releases/springer-nature-accelerates-its-transformative-journey-/16857900 [Accessed March 4, 2020].
15. For example, the Austrian Science Fund (FWF) has taken part in transformative agreements with Springer, Taylor & Francis, Wiley, and IOP Publishing. See agreements ID "iop2017kemoe" "iop2020kemoe" "sc2019kemoe" "tf2017kemoe" "wiley2018kemoe" at ESAC, Agreement Registry. Available at: https://esac-initiative.org/about/transformative-agreements/agreement-registry/ [Accessed February 29, 2020].
16. Schiermeier, Q., 2018. China backs bold plan to tear down journal paywalls. Nature News. Available at: https://www.nature.com/articles/d41586-018-07659-5 [Accessed March 16, 2020].
17. National Health and Medical Research Council, NHMRC Direct Research Costs Guidelines. NHMRC Funding Agreement and Deeds of Agreement. Available at: https://www.nhmrc.gov.au/funding/manage-your-funding/funding-agreement-and-deeds-agreement [Accessed March 5, 2020].

Institutions and research funders may be supporting APCs through a combination of dedicated and ad hoc funding routes:

- **Institutions** will have visibility on APCs that they're supporting centrally, e.g. via publisher agreements or dedicated OA funds, but may be unaware of APCs supported by ad hoc use of institutional funding, e.g. departmental research budgets – these are APCs 'in the wild'
- **Research funders** will be aware of APCs that they support via dedicated OA funds, and in cases where these funds are distributed by institutions, e.g. UK OA block grants, these funding streams are also visible to institutions.[23] However, both funders and institutions may have little awareness of APCs funded via main research grant funds – also APCs 'in the wild'

Figure 1. APC funding sources and distribution mechanisms



APC monitoring efforts

When framing our research questions for this study, it was our expectation that institutions may find it more challenging to monitor APC payments that are sourced from or distributed outside central institutional management. A number of reports point to the fact that only a minimum amount of actual APC spend is tracked as a result of these missing costs not being centrally reported or paid. Prior analysis has indicated that institutions tracking OA costs are typically only reporting on spend from their own institutional budgets, although they are aware that the total cost of OA for researchers from those institutions will be significantly higher.[24] One estimate is that the cost may be some 20% higher than recorded.[25]

Over the last couple of years, developments in databases that track OA at an article level have provided institutions with more tools to track OA publications by their

authors, with the integration of Unpaywall data into databases such as Scopus, Web of Science, and Dimensions greatly facilitating identification of hybrid OA articles in particular. However, these sources do not provide consortia or funders with data on the sources of APC funding underlying these publications, and as such these organisations are reliant on their own workflows, and those of publishers, to enable this.

Increasing numbers of centralised agreements to cover the costs of OA publishing are facilitating greater visibility in this area for the organisations involved, and institutions and consortia are in some cases seeking to share and aggregate this data to give greater insights through initiatives such as OpenAPC. These agreements usually only enable visibility on APCs that have already been 'tamed' however, having been funded via centralised sources. In some cases institutions may need to have an understanding of existing APC funding and payments *before* they can establish such arrangements for centralisation, and there APCs 'in the wild' present a challenge. The need for universities to have a complete overview of the costs involved in subscriptions and OA publishing is emphasized within the OA movement,[26] and within this report we have sought to explore some of the obstacles and solutions that may be available to enable this.

18. University of California Publisher Strategy and Negotiation Task Force. 2019. An introductory guide to the UC model transformative agreement. Available at: https://osc.universityofcalifornia.edu/uc-publisher-relationships/resources-for-negotiating-with-publishers/negotiating-with-scholarly-journal-publishers-a-toolkit/ [Accessed February 29, 2020].
19. Crawford, W., 2015. Open-Access Journals: Idealism and Opportunism. ALA Library Technology Reports. Available at: https://doi.org/10.5860/ltr.51n6 [Accessed March 4, 2020].
20. Directory of Open Access Journals. Available at: https://doaj.org/ [Accessed March 4, 2020].
21. European Open Science Monitor reports for 2018: 18.5% articles gold OA in fully OA titles, 6.3% OA in hybrid journals. [based on Scopus and Unpaywall data]. European Commission. 2019. Trends for open access to publications. Open Science Monitor. Available at: https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/open-science-monitor/trends-open-access-publications_en [Accessed March 4, 2020].
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25. Andrew, T., 2016. Improving estimates of the total cost of publication by recognising 'APCs paid in the wild'. *The Winnower*. Available at: https://thewinnower.com/papers/4241-improving-estimates-of-the-total-cost-of-publication-by-recognising-apcs-paid-in-the-wild [Accessed March 4, 2020].
26. Lovén. Monitoring open access publishing costs at Stockholm University.

Part one: Author payments - data from researchers

Springer Nature conducted a survey of our authors in order to gain insights into the APC funding, payments, and tracking landscape – including:

- Which sources of funding are used for OA APCs?
- Who arranges the APC payment?
- Do authors believe their institution is aware of their most recent APC payment?

Nearly half of respondents combine two or more main sources of funding in order to cover their APC

Methodology

Questions on these three topics were posed to Springer Nature authors who were taking part in a Post Publication Author Satisfaction Survey. These authors were qualified as being the corresponding author on a published OA article in either a fully OA or hybrid journal and as having paid an APC. Authors received the survey within a week of publication of their OA article. Questions were live for two months from 27th June 2019 to 29th August 2019, and the total base size of people who answered the questions about the funding and payment of APCs was 1,014.

When asking authors about funding for their APC, we allowed selection of multiple options. We did not ask authors to indicate the *value* of funds used from each of these sources, and as a result, we cannot infer what proportion of OA costs are being borne by these different types of organisations at present. Nevertheless, the data provide useful insights into the frequency with which authors are making use of different OA funding streams, and the complexity of a landscape in which a single APC may be funded by a number of different organisations and funding types.

Due to the higher number of responses from fully OA authors (820) compared to hybrid OA (194), we have been able to analyse geographic differences at a more granular level for fully OA authors, drilling down to country level where base sizes allow, and looking at regional splits where necessary. For hybrid OA responses, the data have been split between authors based in Europe and those in the rest of the world (ROW).

As the survey focused on Springer Nature OA articles and authors, its findings should be interpreted with this in mind. For instance, in some cases responses will be influenced by the OA business models available to Springer Nature authors, such as the existence of transformative (Compact) agreements supporting APCs for many OA authors in our hybrid portfolio. Where there is strong reason to believe responses for Springer Nature authors may differ from those for the OA market as a whole, this has been indicated in the discussion of data.

Findings

1.1 APC funding complexity

We asked authors to indicate which funding sources they used to cover the cost of their APC, giving the option to select multiple answers from the range of different institutional, research funder, and 'other' options. During analysis we classified these fund types by:

- **Main source:** Research funder / institution / publisher agreement (may be supported by the author's institution and/or research funder) / other
- **APC 'wildness'**: APCs less easily monitored, i.e. 'in the wild' / APCs more easily monitored (see figure 2)

Figure 2. Classification of APC funding types during analysis

Fund type	Source	'Wildness'	Description used in author survey
Institutional OA fund	Institution	More easily monitored	Dedicated OA funds from my institution (excluding block grants from funders)
Publisher OA agreement (hybrid / fully OA)	Institution and/or research funder	More easily monitored	The publication fee was fully covered by my funder/ institution's OA membership with the publisher
OA block grants from research funder (via institution)	Research funder	More easily monitored	Dedicated OA funds from my main research funder, distributed via OA block grants to my institution
Dedicated OA fund from research funder	Research funder	More easily monitored	Dedicated OA funds from my main research funder (excluding OA block grants distributed via institutions)
Main research grant – budgeted	Research funder	APCs 'in the wild'	I used a budgeted OA allocation from my main research grant
Main research grant – remaining funds	Research funder	APCs 'in the wild'	I used remaining funds from my main research grant (not dedicated OA funds)
Institutional funds not dedicated to OA	Institution	APCs 'in the wild'	I used funds from my institution that were not dedicated OA funds
Funds from org. other than main funders/ institution	Other	APCs 'in the wild'	Dedicated OA funds from an organisation that is not my main research funder/institution
Co-author	Other	APCs 'in the wild'	My co-author(s) funds (from their own funder, institutional or personal funding)
Personal funds	Other	APCs 'in the wild'	I used my own personal funds/ savings
Other	Other	APCs 'in the wild'	Other (please specify)

Responses to this question demonstrate that the APC funding landscape for Springer Nature authors is complex (Figure 3):

- Nearly half of respondents (47% of fully OA authors, 44% of hybrid OA authors) combine two or more of these main sources of funding in order to cover their APC
- Of these authors, 18% of fully OA and 17% of hybrid OA authors are combining three or more main funding sources for their APC

From an institutional viewpoint this use of multiple funding sources may bring complications, as any effort to understand the costs and funding sources for APCs must contend with a multitude of small contributions to individual APCs. From the perspective of the author this potentially also adds to the administrative burden of arranging funding for OA, and there is clearly room for greater efficiencies in this space.

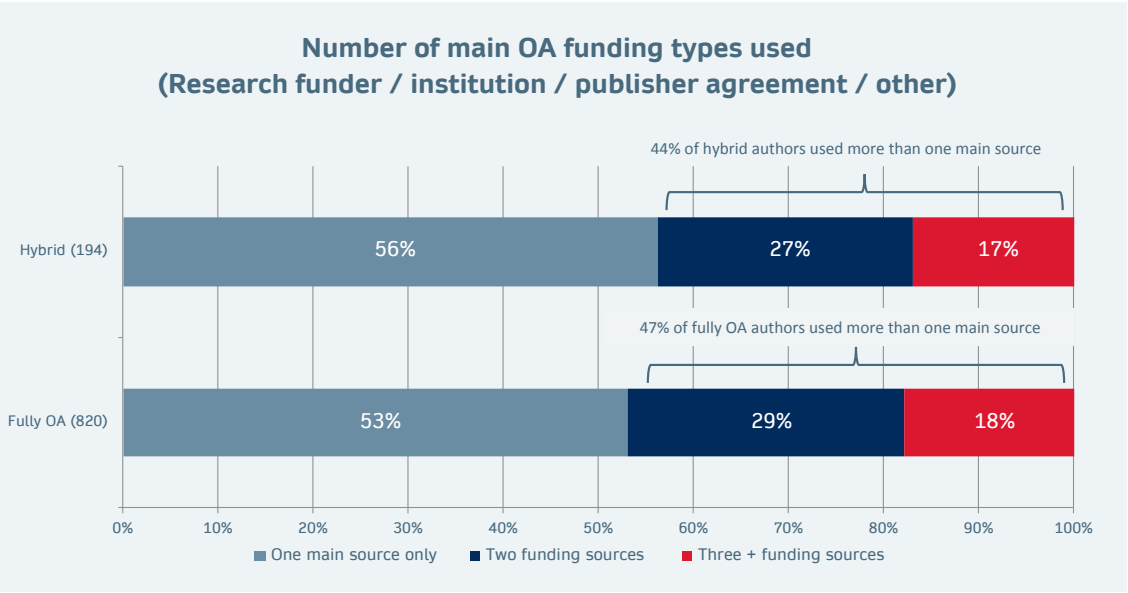
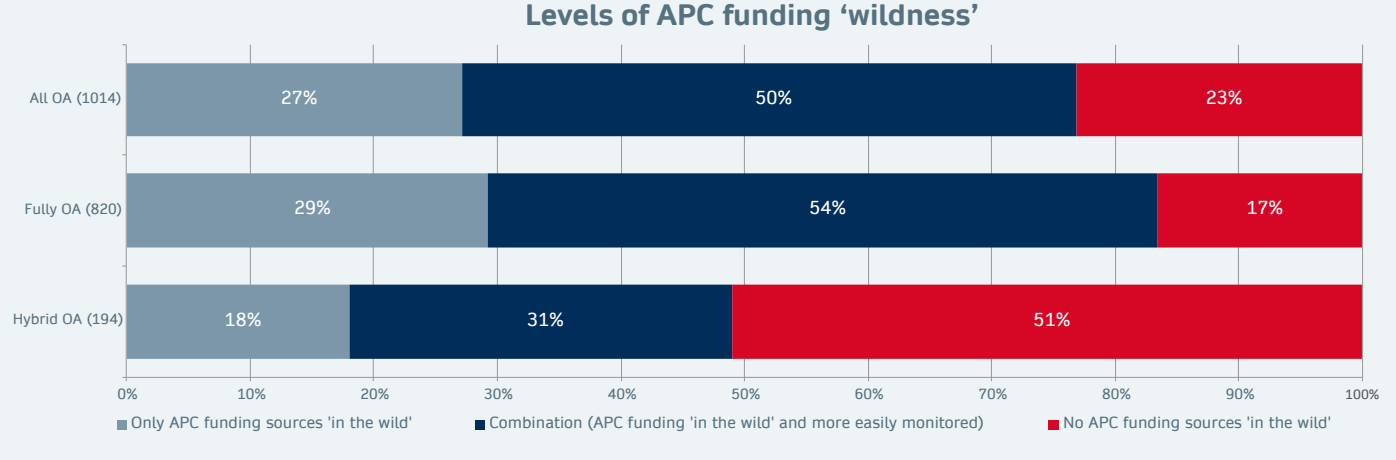


Figure 3. Number of main OA funding types used to cover APC

Due to authors combining different sources of funds, APCs vary in their degree of 'wildness'. Some APCs may be purely 'in the wild' and therefore likely to be much more difficult to monitor, while others may have been paid from a combination of APC funding sources 'in the wild' and those that are more easily monitored, and there are also authors who make no use of APC funding sources 'in the wild' (see Figure 4).

- 27% of Springer Nature OA authors surveyed used only 'wild' funding sources for their APC, and a further 50% combined an APC funding source 'in the wild' with funds from more easily monitored sources
- The figure is even higher for fully OA Springer Nature authors, of whom 29% used only APC funding sources 'in the wild', and 54% used a combination of 'wild' and more easily monitored APC funding sources
- For Springer Nature hybrid authors, 18% used only APC funding sources 'in the wild', and 31% used a combination of 'wild' and more easily monitored APC funding sources. The levels of APCs 'in the wild' are expected to be even higher among hybrid authors as a whole, since Springer Nature's sample includes over a third of hybrid respondents whose APCs were supported by transformative agreements via Springer Compact

Figure 4. Levels of APC funding 'wildness'

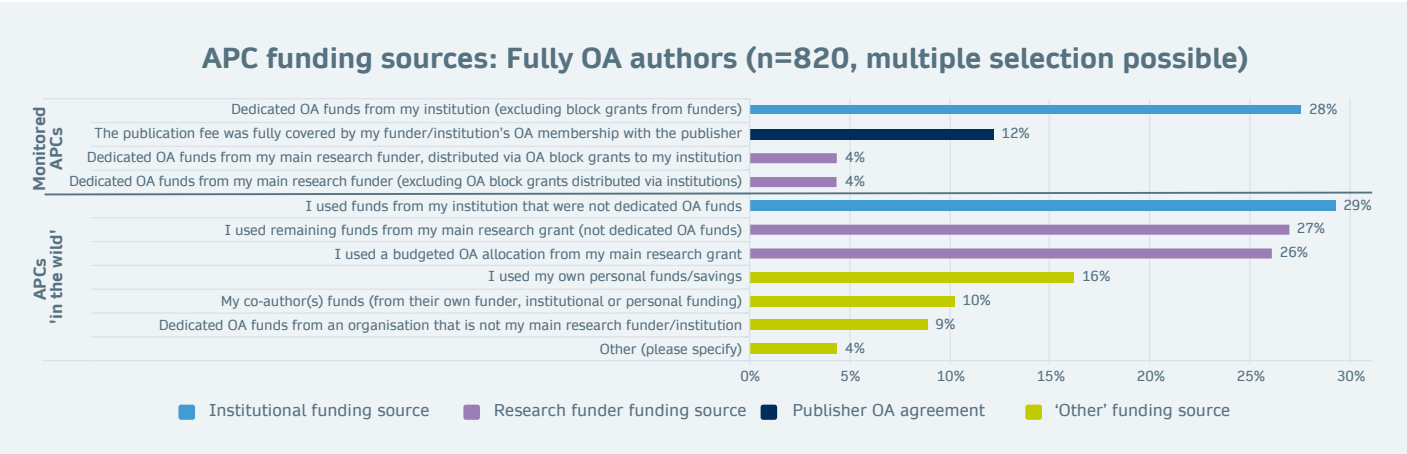


When we examined the specific types of funding used by authors, we found that there is no dominant source of funding for either fully OA or hybrid OA authors.

Fully OA Springer Nature authors surveyed used a wide variety of funding sources, many of which are not necessarily centrally managed or monitored by institutions or research funders (Figure 5):

- The most commonly used funding source is institutional funds that are not dedicated to OA, used by 29% authors – a type of APC funding 'in the wild'
- 28% of fully OA authors drew on dedicated institutional funds, which are likely to be monitored
- Research grants are also commonly used for fully OA APCs, both from remaining funds (27% authors) and funds budgeted for APCs (26% authors), both of which institutions may struggle to centrally monitor

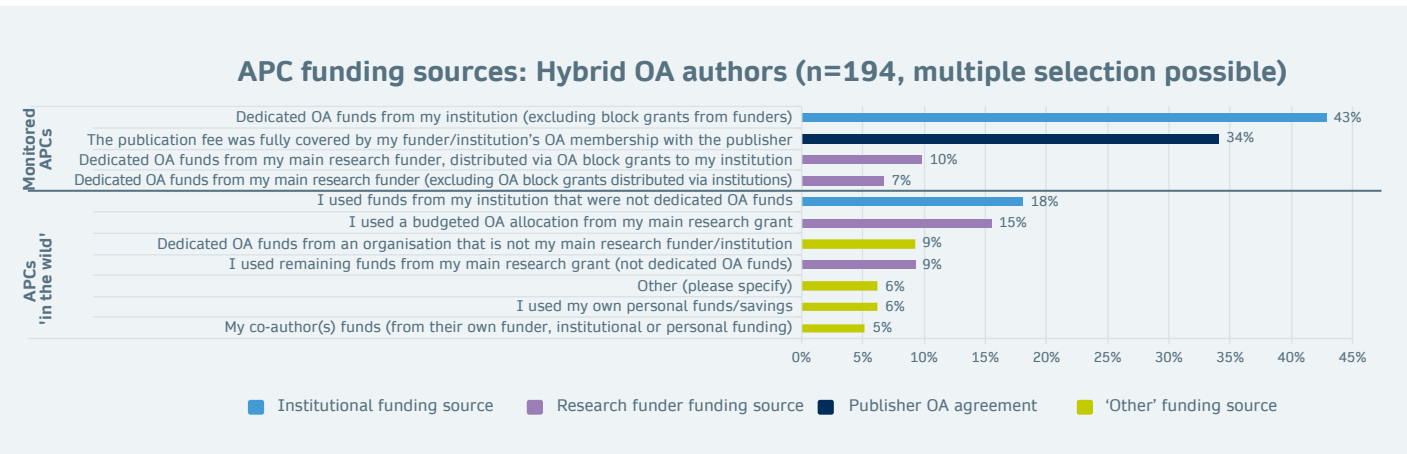
Figure 5. APC funding sources for fully OA authors



Springer Nature hybrid OA authors also use funds from a range of sources (Figure 6), although, as we have noted above, there is less use of 'wild' APC funding sources than for fully OA:

- The most commonly used funding source is institutional funds that are dedicated to OA (43% authors)
- In second place, 34% of hybrid OA authors were supported by publisher agreements – this was unsurprising for this sample, given that Springer Nature has a number of successful transformative Compact agreements in place with consortia
- We see much lower proportions of hybrid authors making use of their main research grant funds, compared with fully OA authors – only 15% of hybrid authors used budgeted funds from their grants, and 9% remaining grant funds

Figure 6. APC funding sources for hybrid OA authors



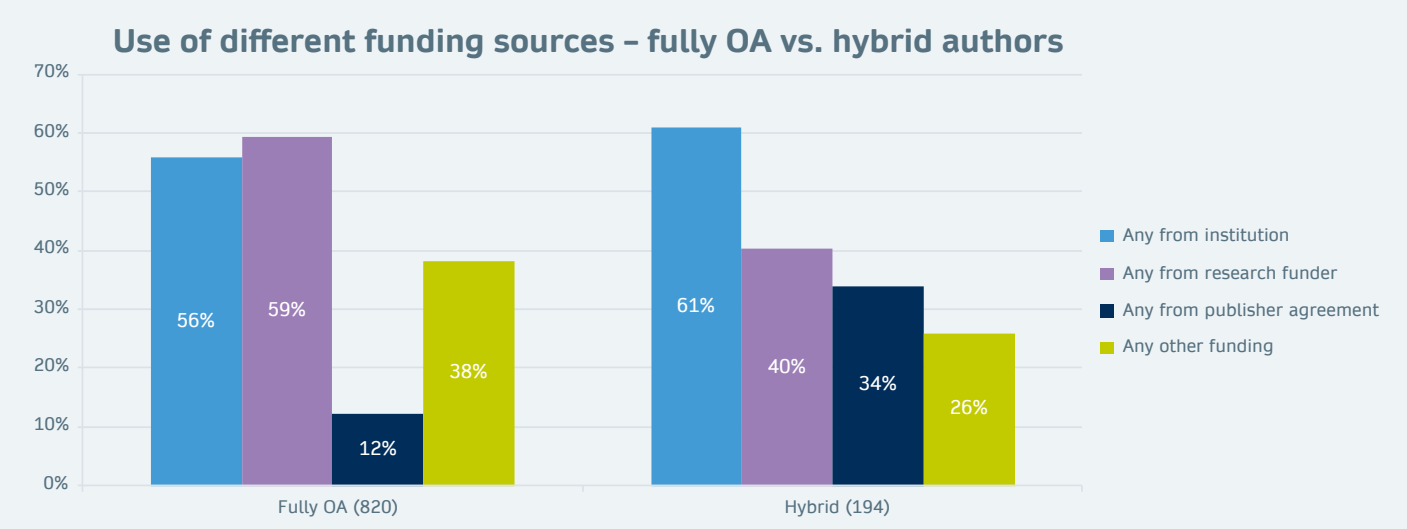
As noted above, these results have clearly been affected by the agreements in place to support authors in funding hybrid OA in Springer Nature journals, and as such may not necessarily be representative of hybrid OA funding in the market as a whole. Despite the increasing pace of new transformative agreements between publishers, institutions, and in some cases funders, many authors will not (yet) be covered by such deals.

Since authors were able to select multiple funding sources, we also examined the total percentage of authors making any use of funding from within each of the four main categories of institution, research funder, publisher agreement, and 'other' (Figure 7). This approach eliminates the duplication that would occur if adding together total percentages of authors making use of OA-dedicated and non-dedicated institutional funds for example, since some authors made use of both sources.

- For both fully OA and hybrid authors it was common to make some use of institutional funds, with 56% of fully OA and 61% of hybrid doing so
- 40% of hybrid OA authors drew on funds from their research funder to cover their APC, while for fully OA authors the figure is even higher at 59%
- There is also relatively high usage of 'other' funds, at 38% for fully OA and 26% for hybrid

Considering this data in conjunction with the more detailed breakdown of funding types in figures 5 and 6, we can see that it is common for authors to make use of funds from outside of the library budget and dedicated institutional OA funds. Authors are also drawing on other ad hoc institutional funds and funds from their research funders, and 'other' sources. This demonstrates the opportunity for transformative and fully OA agreements to consolidate funds from multiple sources, as has been the case for some existing Springer Nature agreements.

Figure 7. Use of main funding sources – fully OA and hybrid



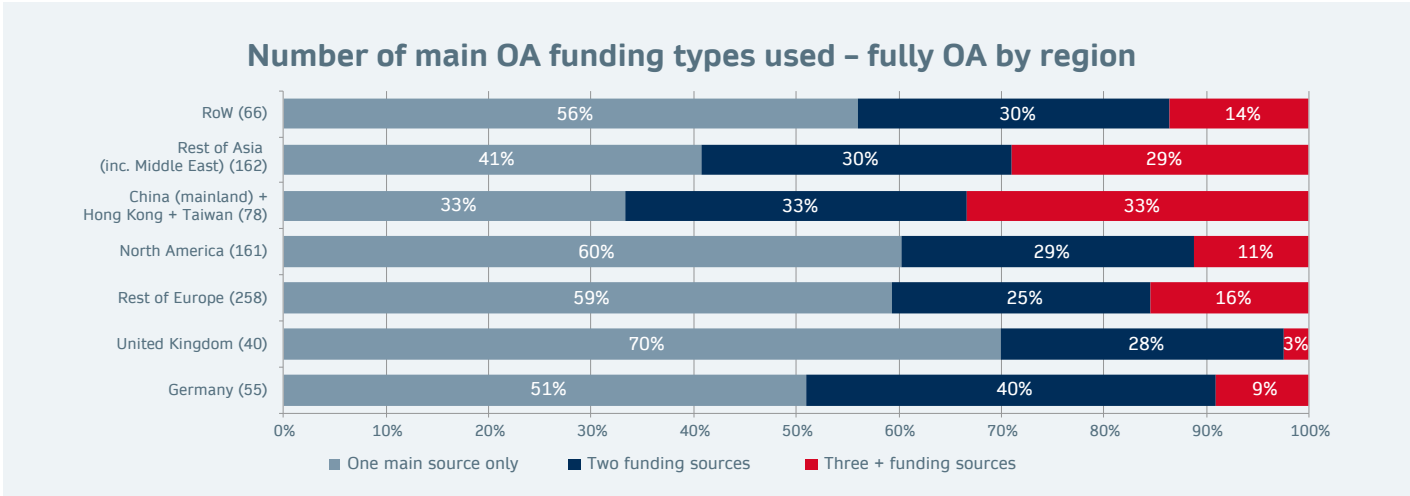
1.2 APC funding: regional differences for fully OA authors

As noted in the introduction, regions and nations have taken different approaches to OA funding and policy, and we see this geographic variation reflected in authors' responses regarding APC funding. It is no surprise that in countries where there are higher levels of dedicated APC funding, authors are less reliant on combining multiple main sources of funds to cover their APCs, and a lower proportion of authors make use of APC funding sources 'in the wild'. However, the data shows that even in these well-funded locations, there is still a long tail of fully OA APC payments that are 'in the wild', and therefore more challenging to monitor.

In all the countries and regions analysed we see some fully OA authors drawing on two or more main sources of funding to cover their APC, but the frequency of this varies (Figure 8).

- In the UK where there are higher levels of dedicated OA funding from both institutions and research funders (via block grants), 70% of fully OA authors used a single main source to pay their APC, and only 3% used three or more main funding sources
- In China, by contrast, only 33% of fully OA authors used a single main source to pay their APC, and a further 33% used three or more sources
- North America falls somewhere in between, although it is closer to the UK, with 60% of authors making use of funds from a single main source, and only 11% making use of three or more main sources

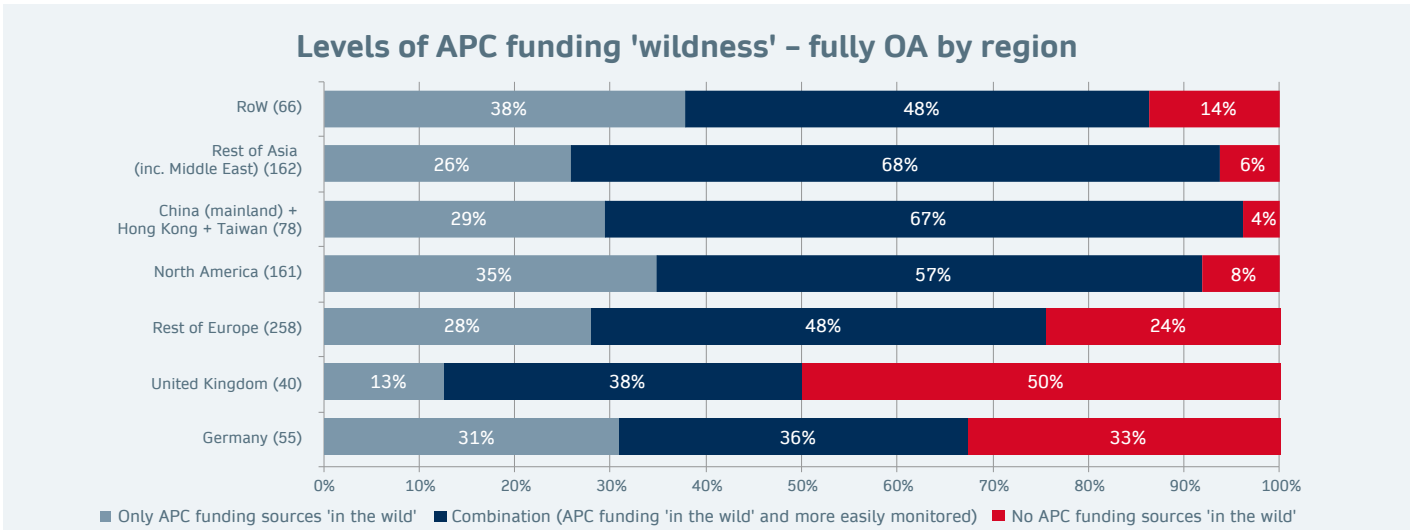
Figure 8. Number of main OA funding types used – fully OA authors by region



Levels of APC 'wildness' also follow regional patterns (Figure 9):

- Among fully OA authors, the UK has the lowest levels of APCs 'in the wild', with 50% using funds 'in the wild', either alone (12.5%) or in combination with other funds (37.5%). This reflects the greater availability of dedicated APC funding streams from institutions and research funders
- For China the proportions are much higher, with 96% of fully OA authors using APC funding sources 'in the wild', either alone (29%) or in combination with other funds
- Interestingly, while North America has a slightly lower total proportion of fully OA authors drawing on APC funding sources 'in the wild' (92%) than China, a higher proportion of authors make use of *only* 'wild' APC funding sources at 35%

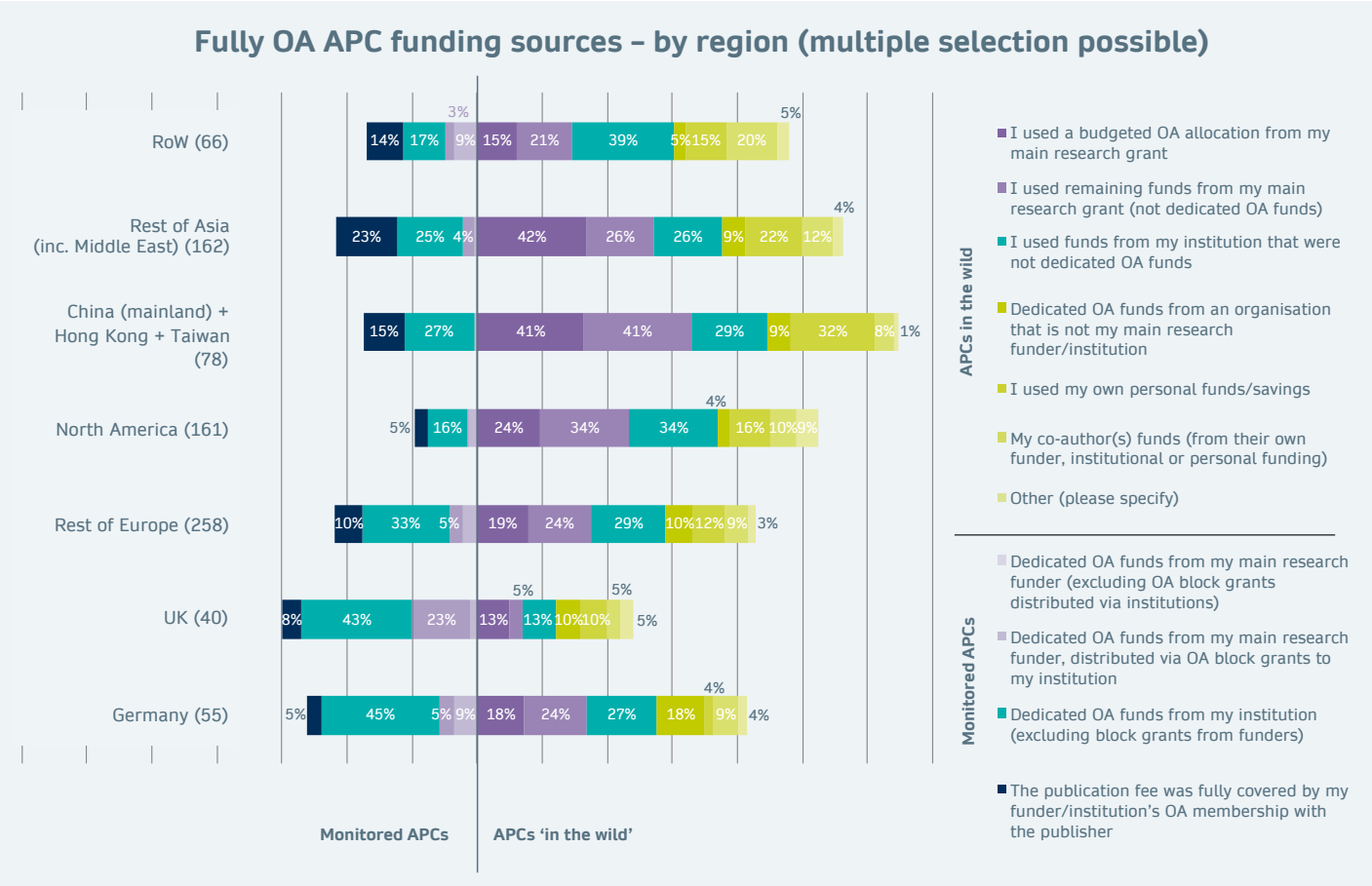
Figure 9. Levels of APC funding 'wildness' – fully OA by region



These regional differences in 'wildness' can be better understood when looking in more detail at the specific types of APC funding sources used by fully OA authors (Figure 10).

- In the UK, 43% of fully OA authors drew on dedicated institutional OA funds, and the second most common source was OA block grants from research funders (23%) – both APC funding sources that are monitored by institutions. However, even in the UK, there is a long tail of authors making use of APC funding sources that are less easily monitored, highlighting that there are still authors without access to dedicated funds
- In China, the most common sources of funds for fully OA authors were main research grants (41% budgeted, and 41% remaining funds), the third most common source was use of personal funds (32%), followed by institutional funds not dedicated to OA (29%) – all of which are APC funding sources 'in the wild'
- For fully OA authors in North America, the most commonly used sources were institutional funds not dedicated to OA (34%) and remaining grant funds (34%), followed by budgeted grant funds (24%) – all are APC funding sources 'in the wild'

Figure 10. Fully OA funding sources by region. Data also available in table format in Appendix 1



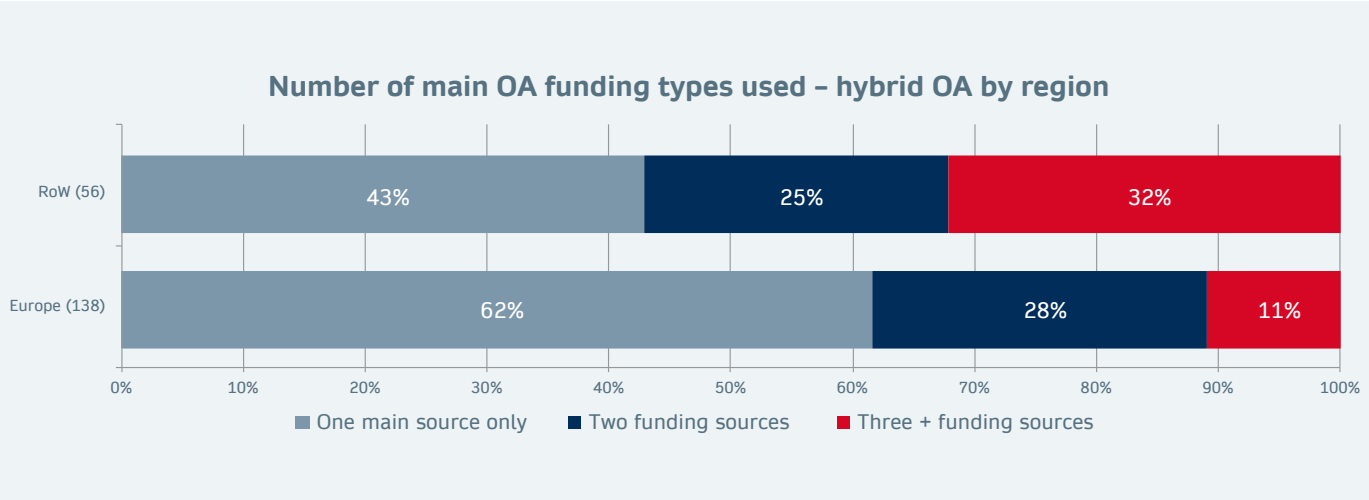
1.3 APC funding: regional differences for hybrid OA authors

For hybrid authors, as previously noted the size of the sample prevents us from examining the data in such granularity, but even splitting responses into those from Europe vs. the rest of the world (ROW) highlights regional variation. As we see below, hybrid authors based in Europe are less reliant on combining funding sources to cover their APC and have a lower proportion of APCs using funding sources 'in the wild'. These differences reflect the higher access to dedicated OA funds in Europe as well as the European focus of Springer Nature's earliest transformative publisher agreements.

The number of main funding sources used varies regionally for hybrid authors (Figure 11):

- 62% of European Springer Nature hybrid OA authors used only one main source for their APC, and only 11% used three or more main funding sources
- This compares to 43% of ROW authors using only one main source, and 32% using three or more

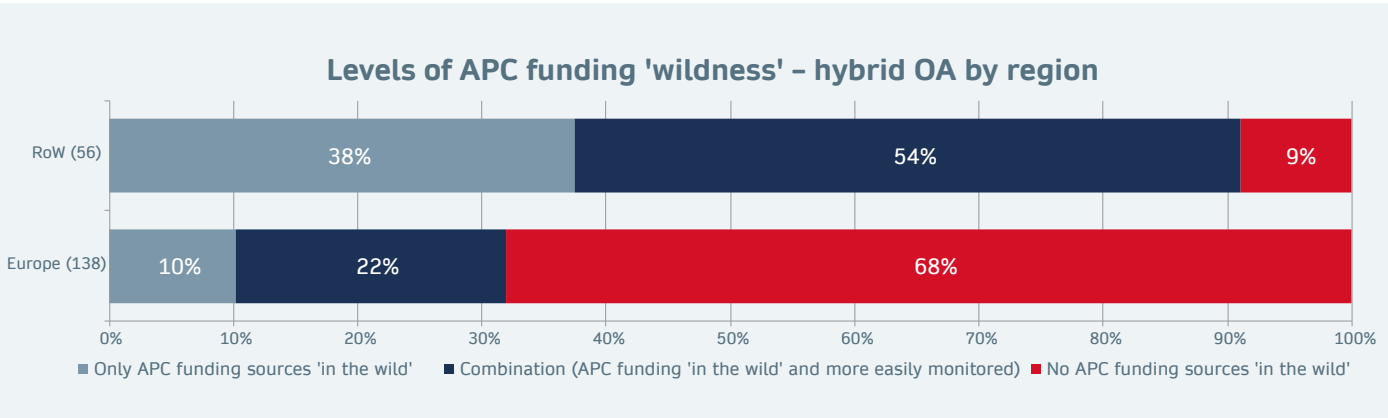
Figure 11. Number of main OA funding types used - hybrid OA authors by region



Levels of APC 'wildness' are also lower for Springer Nature hybrid authors in Europe (Figure 12):

- Only 10% of hybrid OA authors in Europe relied purely on APC funding sources 'in the wild', and 68% used only APC funding sources that are more easily monitored
- For hybrid OA ROW authors, 38% used only APC funding sources 'in the wild', and a further 54% used 'wild' sources in combination with more easily monitored sources

Figure 12. Levels of APC funding 'wildness' - hybrid OA by region



APC funding sources used by hybrid authors provide more insight into this (Figure 13):

- Springer Nature hybrid OA authors in Europe reported using dedicated institutional OA funds in 50% of cases, and publisher agreements in 42%, with all other funding sources used by 10% or fewer
- For hybrid ROW authors, dedicated institutional OA funds were also the top source at 38%, tied with using a budgeted allocation of research grants (38%), with institutional funds dedicated to OA reported as the third most commonly used source at 25%

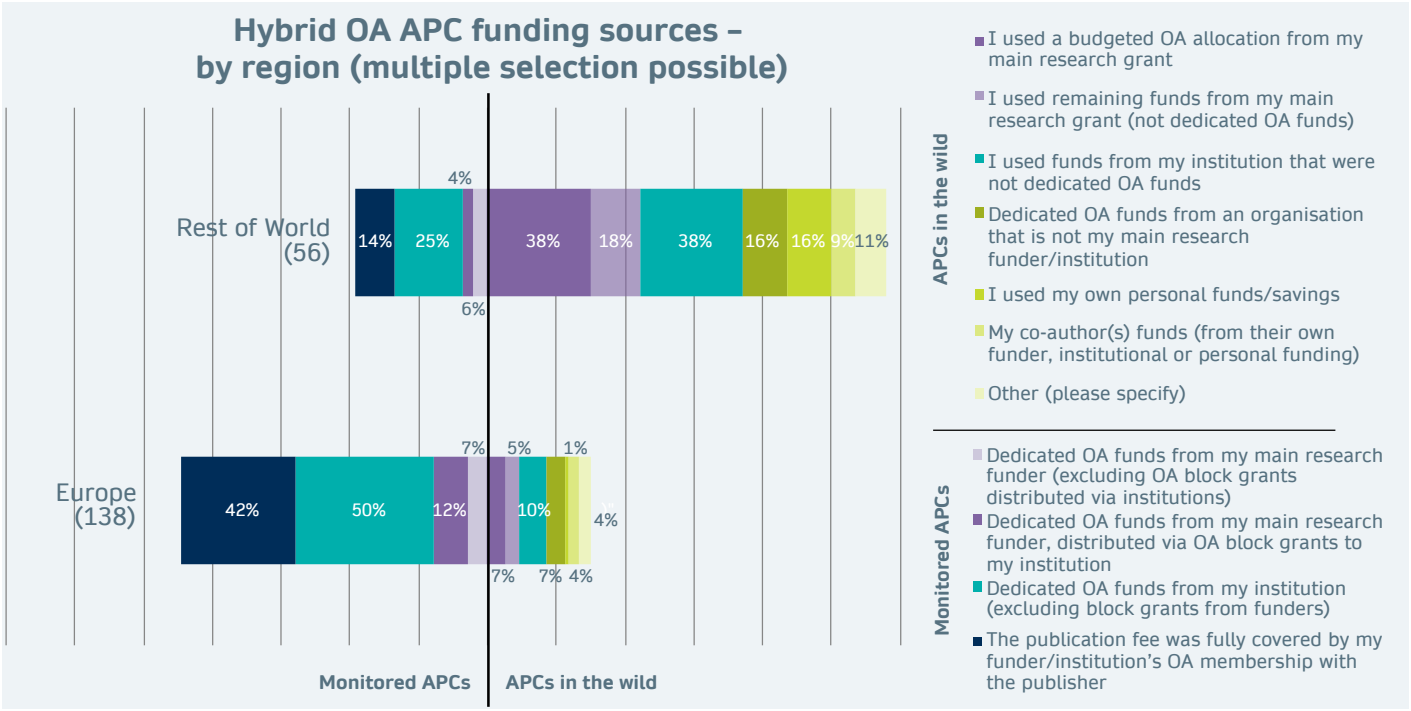


Figure 13. Hybrid OA APC funding sources by region. Data also available in table format in Appendix 1

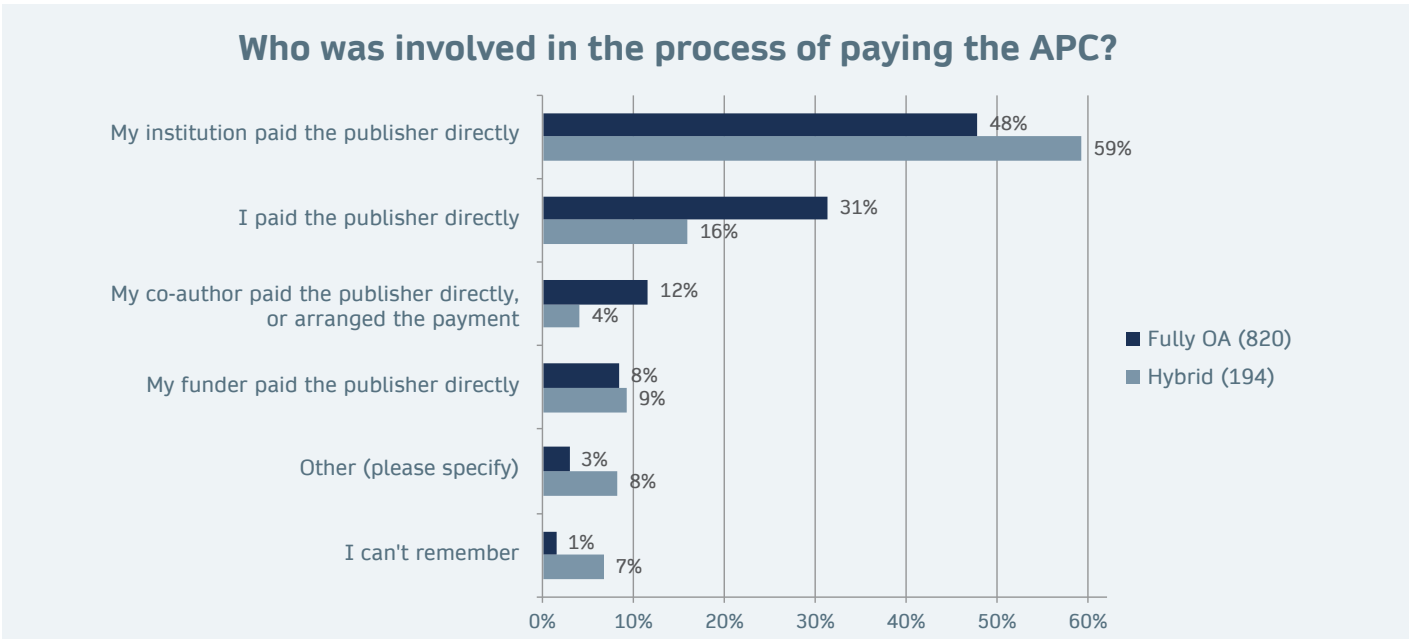
2. APC payment handling

In addition to exploring sources of APC funding, we also asked authors about who arranged the payment of their APC (Figure 14), and found that institutions play a key part in this aspect of the APC process:

- It is most common for the institution to arrange payment for both fully OA (48%) and hybrid OA (59%) authors
- However, fully OA authors are much more likely to arrange payment themselves than hybrid (31% vs 16%) reflecting greater use of 'wild' funding sources, and making it harder for institutions to monitor these fully OA APCs

Note that a small number of authors selected more than one option, and so percentages total to more than 100.

Figure 14. Who was involved in the process of paying the APC?

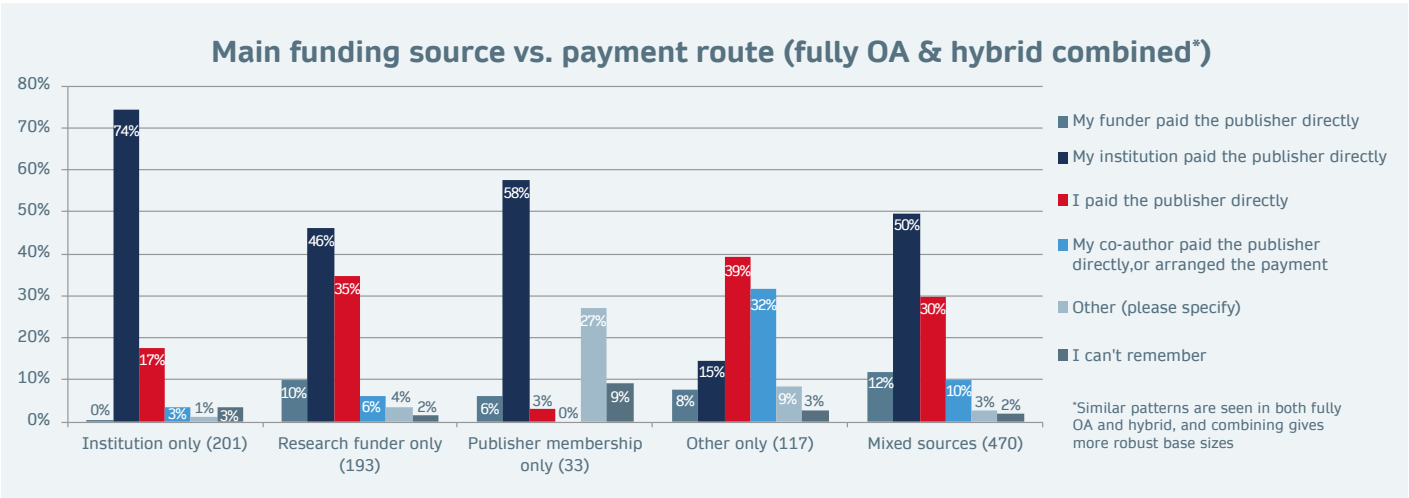


We also examined the relationship between the main funding source used by authors, and who was involved in the process of paying the APC. Interestingly we found that institutions play a leading role in arranging payment for many different funding streams, including (although to a lesser extent) where they are not the main source of APC funds (Figure 15).

- Unsurprisingly it is the institution that most commonly arranges payment where funds come from the institution only – 74% of such authors said the APC was paid by the institution
- This is also true for cases where a publisher agreement fully covered the APC – 58% reported institutional involvement in paying the APC, and 27% 'other' involvement, likely reflecting the fact that such agreements generally remove the need for article-level payments
- However, the institution is also the most common payee for authors using only research funder support (46% institutional involvement in payment) or mixed sources (50%), perhaps reflecting institutions' roles in administering research funds, OA block grants, and other sources

This involvement could present an opportunity for institutions to monitor APC funding sources for a substantial proportion of articles, although monitoring only those cases where an institutional contact arranged payment would still not provide a complete picture of spend. We will further explore this through institutional feedback in part two of this report.

Figure 15. Main funding source vs. payment route - fully OA & hybrid combined



Institutions desirous of monitoring APCs will face different scales of challenge depending on their levels of involvement in APC payment workflows. We examined responses from fully OA authors surveyed, and found clear differences (Figure 16):

- In the UK and Germany, over three quarters of fully OA authors stated that their institution paid the publisher directly (78% for the UK, and 76% for Germany)
- By contrast, it is most common for Springer Nature fully OA authors to pay their publisher directly in China (56%) and the rest of Asia (51%)
- Fully OA authors in North America fell somewhere in between, with 37% reporting that they paid the publisher directly, and 47% that their institution made the APC payment

Due to base sizes, similar levels of granularity were not possible for hybrid OA responses, but a breakdown between Europe and ROW can be seen in Appendix 1.

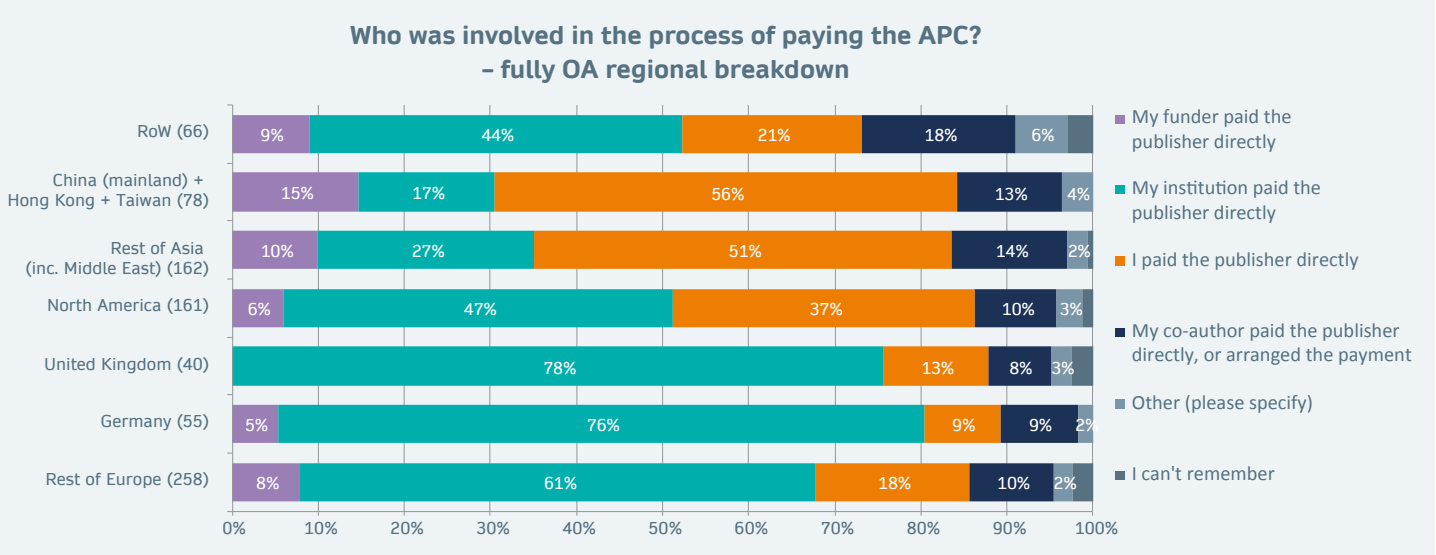


Figure 16. Who was involved in the process of paying the APC? - fully OA regional breakdown

3. Institutional ability to track APCs

The final topic on which we surveyed authors was their level of confidence that their institution was tracking their APC payment, or would be able to do so if required. Overall, their responses revealed a relatively high level of uncertainty for both hybrid and fully OA authors (Figure 17):

- 50% of fully OA and hybrid OA authors surveyed were not confident that their institution would be able to centrally monitor their APC
- An additional 8% of fully OA authors and 3% of hybrid OA authors thought it would be impossible for their institution to centrally monitor their APC

Where authors do believe APC monitoring is occuring or at least possible, approaches vary between hybrid and fully OA:

- 20% of Springer Nature fully OA authors stated that they had or would inform their institution of the APC payment, and only 10% believed their APC was being automatically monitored
- For Springer Nature hybrid OA authors, 15% stated that they had or would inform their institution of the APC payment, while 19% believed their APC was being automatically monitored, likely reflecting the impact of centralised billing and reporting enabled by transformative agreements for Springer Nature hybrid authors

A regional breakdown of responses on the topic of institutional APC monitoring is provided in the Appendix 1.

When we split the data to look at responses according to sources of funding, it's interesting to note that even where funding for an APC comes from the institution there are still researchers that think that it would not be possible for their institution to track the payment centrally (Figure 18):

- 46% of authors using solely institutional APC funding reported uncertainty about whether their institution would be able to centrally monitor the APC, perhaps reflecting authors' use of more ad hoc institutional funds that are not dedicated to OA
- A further 7% stated that it would be impossible for their institutionally-funded APC to be tracked by the institution

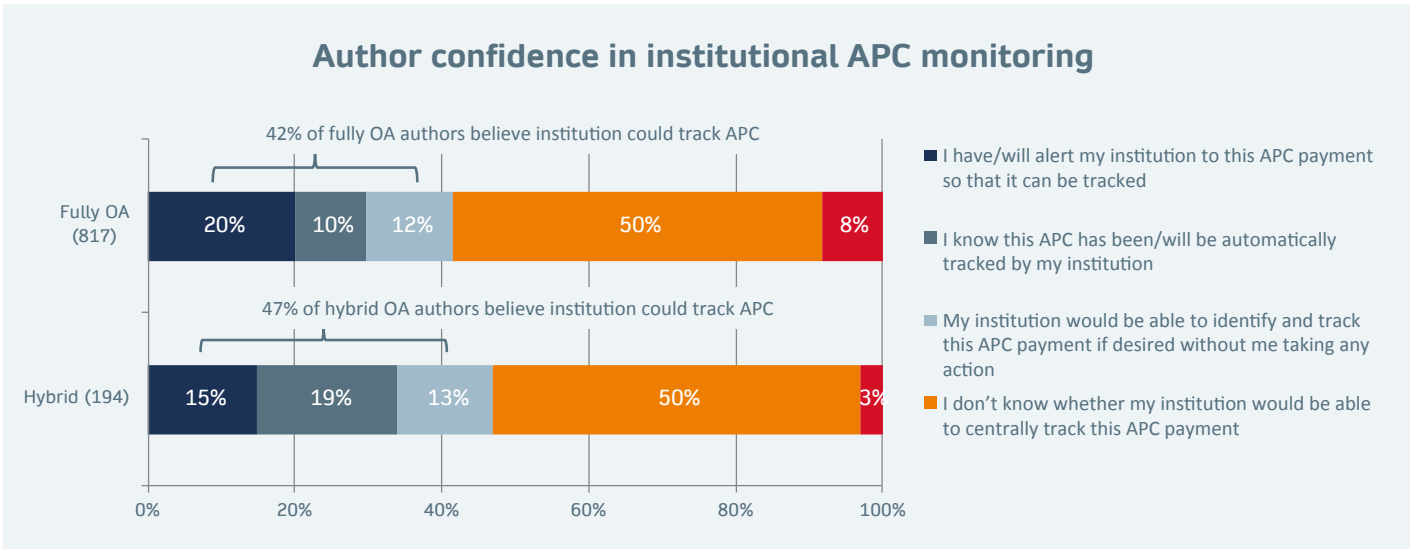


Figure 17. Author confidence in institutional APC monitoring

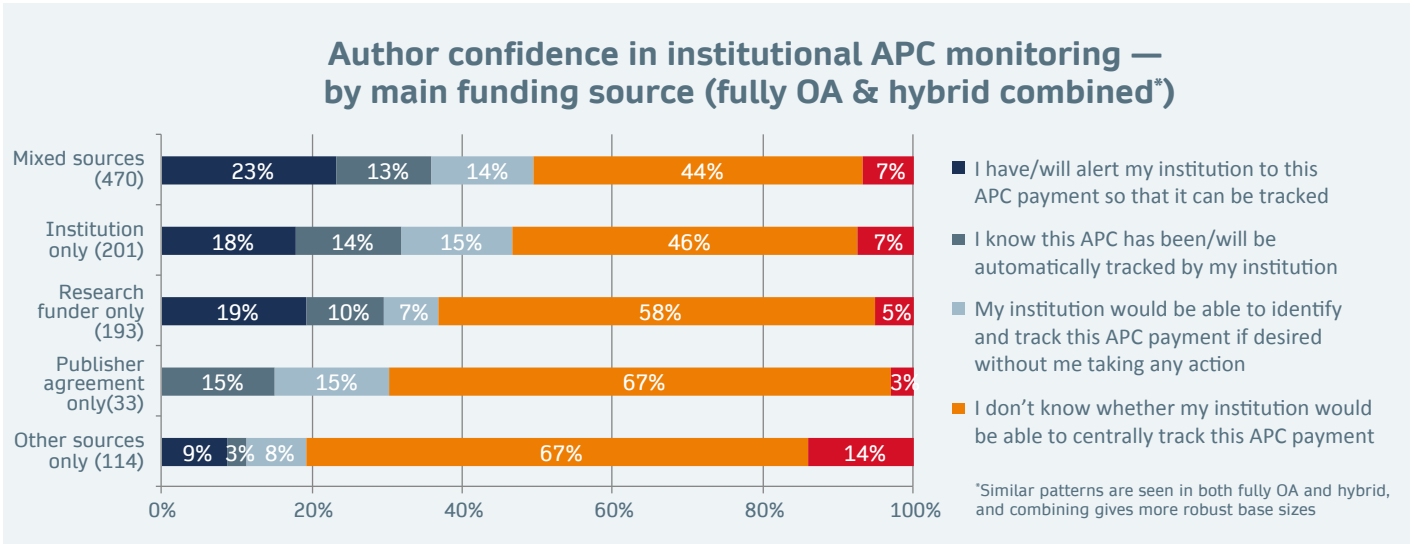


Figure 18. Author confidence in institutional APC monitoring – by main funding source

These responses only convey authors' perspectives, and may not reflect actual institutional APC monitoring levels. However, as we will see in part two of this report, many institutions are also lacking in confidence in their ability to effectively monitor the APC funding and costs for their affiliated researchers.

Part two: The institutional role in APC tracking

In part one, we reviewed the complexities of the current APC landscape, identifying the volume of APC payments that are made 'in the wild', and the opportunity that effective monitoring and tracking of such funds could create in achieving a faster transition to OA. By increasing the visibility of current 'wild' sources of funding, and by consolidating such funds towards OA agreements or central OA budgets, institutions and research funders could together support this accelerated transition. In part two, we set out to better understand the approaches that institutions are taking in the management and monitoring of funds in their own words.

Springer Nature commissioned Pleiade Management & Consultancy to carry out a series of qualitative interviews with institutions. In total, 16 interviews with institutional administrators of OA from across the world were completed, examining:

- General policies and instruments regarding APC handling at the institution, especially with regards to APCs paid 'in the wild'
- Issues and obstacles in tracking APC payments, as seen by the institutions, especially with a view on the APC payments 'in the wild'
- Future/expected developments with regard to APC payments, including future roles of authors and publishers with regard to APC payment tracking

To be able to harness the breadth of APC payments being made 'in the wild', it is expected that the workflows and coordination achieved under model D is likely to be required

Methodology

The interviews were carried out by Maurits van der Graaf of Pleiade Management & Consultancy in cooperation with Tracey Clarke of Tracey Clarke Consulting. Together with Springer Nature, a global list of potential participating institutions was drawn up, focusing primarily on institutions that have a policy that is at least partly supportive of Gold OA with the expectation that for these institutions, APC-payment tracking might be relevant. From this, a shortlist representing a broad geographic spread was selected. However, as Gold OA policies are at this moment in time mainly implemented in the UK, a number of countries across continental Europe and a number of institutions in the USA, our interviews have been predominantly representative of these regions, with only a limited number representing other parts of the world. As such, it is expected that further research would be needed to validate the results beyond the regions represented here. A list of all interviewees is presented in Appendix 3.

Interviews were conducted by telephone or Skype. Ahead of each call, Pleiade Management & Consultancy prepared a short overview of the OA situation in the country of the institution and studied the website of the institution in order to collect basic information about OA policies and handling. In a number of cases, earlier publications on this topic by the institutions were also analysed. In cooperation with Springer Nature, an interview format was developed covering the research topics noted above (see Appendix 4). As a follow up to each interview, a summary of the conversation was prepared and sent to the interviewee for his/her comments and amendments.

Findings

2.1 Stages of monitoring: a model approach

Through the interviews, four main approaches to financing OA, managing and tracking APC payments were identified:

Model A: separate financial streams for subscriptions and APCs
Model B: separate financial streams, with a library OA fund
Model C: research funder in the lead, compliance is key
Model D: library in the lead, aiming to transform the library budget

2.1.a Model A

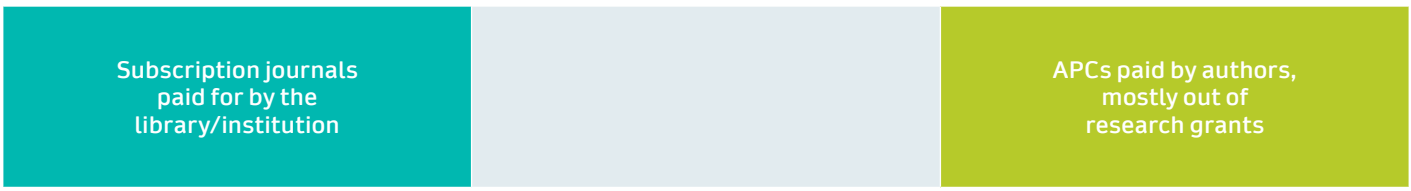


Figure 19. Model A: separate financial streams for subscriptions and APCs

In model A, the financial streams by the library/institution and the research funders are completely separate. The library pays for subscription journals and often follows a Green OA policy with a repository for author manuscripts. The research funders allow researchers to pay APCs from their research grants and a number of them do so. In this situation, the university library sees no immediate need for APC tracking. However, one library that took part in this study did monitor the number of OA articles by their researchers annually using Web of Science. This interviewee suggested that introduction of transformative agreements would require coordination at the national level between the national consortium of academic libraries and the most important research funding organisations for the country, stating that "the library cannot do it alone".

Characteristics of model A:

- **Research registration systems/repositories**: If the library maintains a research registration system and/or an institutional repository, workflows are in place to capture publications and Green OA manuscripts. It should be noted that in some countries, such as China and the United States, some large research funding organisations maintain a repository, thereby reducing the need for institutional repositories
- **No publishers' deals/OA agreements (yet)**: There is a 'wait and see' attitude regarding transformative agreements as they have to be concluded at a national level with (financial) participation of the research funders
- **Sometimes OA monitoring, no APC tracking**: Monitoring OA articles at the institution level is sometimes carried out using bibliographic databases, but there is no need for APC tracking

2.1.b Model B

Figure 20. Model B: Separate financial streams, with a library OA fund

Under model B, the library operates in a similar setting as in A but has added an OA fund to fill the gap for fully OA journals not covered by research grants. APCs for articles in hybrid journals are most often excluded for payment by these OA funds.

Characteristics of model B:

- **Research registration systems/repositories**: workflows are in place to track publications and Green OA manuscripts
- **OA fund**: the library has workflows in order to establish the eligibility of authors without research grants and offers funding towards APCs for fully OA journals
- **No publishers' deals/OA agreements (yet)**: some representatives of the libraries in this setting have expressed scepticism as to whether libraries should pay for hybrid OA at all, and whether doing so will result in a transition to affordable OA
- **Sometimes OA monitoring, no need for institution-wide APC tracking**: in this setting, there is no need for institution-wide APC tracking. However, the APCs paid by the OA fund are tracked and often published openly (in the framework of OpenAPCs)

Figure 21. Model C: research funder in the lead, compliance is key

2.1c Model C

In a number of cases internationally, research funding organisations have taken the lead in encouraging OA. Beneficiaries of their research grants are obliged to publish the articles resulting from their research projects OA.

In the UK, this has led to block grants for APCs, which are managed by the library of the institution, but paid from the research funder(s). In other cases, libraries act as intermediaries between the research funder and authors for APC payment. The library's main role is thus focused on supporting authors in complying with their research funder mandates. Increasingly, institutions in this model have concluded publisher agreements for OA. These publishers' deals are most often concluded at a national level, sometimes with financial support from research funding organisations (for example contributions from funder block grants to the agreement between Jisc and Springer Nature in the UK). So, this might mean that model C might gradually change into model D.

Sometimes, model C libraries also have an OA fund for articles that are not covered by publishers' deals or by research grants.

Characteristics of model C:

- **Research registration systems/repositories**: workflows are in place to track articles published by authors at the institution, preferably at the time of acceptance of the manuscript
- **Block grants**: APC tracking is part of the workflow for managing block grants and other arrangements where the library acts as intermediaries for research funders. Some libraries complement this with an institutional OA fund for articles that are not covered by research grants and/or publishers' deals
- **Publishers' deals/OA agreements**: as part of various publishers' deals between the library and the publishers, workflows are in place to monitor the number of OA articles published under these deals
- **OA monitoring and institution-wide APC tracking**: in order to create an overview

of all APC spending by the institution (and compliance by the authors), workflows for tracking 'APCs in the wild' are often in place at these libraries. Among 'APCs in the wild' are APCs paid by authors from their research grants and from other sources, without the library as intermediary

Figure 22. Model D: library in the lead, aiming to transform the library budget

2.1.d Model D

Under model D, the library budget for the collection is (explicitly or implicitly) transformed into a budget for publishing OA. To achieve this goal, it is necessary to have an overview and control of the total cost of OA publications and the total cost of other licences. In addition, the monitoring of OA publications and the costs are important to inform policy with regard to publishers' deals.

Characteristics of model D:

- **Publishers' OA agreements**: the library actively seeks publisher agreements with regard to OA publishing. These deals are often concluded at a national level, sometimes with the financial support of the research funders in the country. Between the library and the publishers, workflows are in place to monitor the number of OA articles published under these deals
- **Institution-wide APC tracking and OA monitoring**: in order to create an overview of all APC spending by the institution (and compliance by the authors), workflows for tracking 'APCs in the wild' are often in place at these libraries. Annual monitoring of all OA articles is used as a control mechanism for regular workflow tracking
- **OA fund**: an institutional OA fund is in place to cover APCs for articles that are not part of publishers' deals/research grant projects
- **Research registration systems/repositories**: workflows are in place to capture the publications by the authors of the institution, as described above

2.2 What does this tell us?

It is perhaps not surprising that emphasis on tracking and workflows increases as the costs for these APCs become either partly or directly the responsibility of the institution/library. In model A, policies for OA and payments for APCs are predominantly driven by the research funder, and there is little motivation for institutions to undertake regular monitoring or tracking of APC payments. Nevertheless in some instances we see some attempts to undertake tracking. With model B, where the institution takes responsibility for the provision of some APC funds, these become both easier and increasingly important to track, although the complete picture of APC spend for the institution remains of lower priority compared with the tracking of payments funded by the institution. Under models C and D, tracking is now not only important but is essential to be able to get a complete picture of APC spend. To be able to harness the breadth of APC payments being made 'in the wild', and to accelerate a transition to OA, it is expected that the workflows and coordination achieved under model D is likely to be required. This increased visibility of funds from both the institution and research funders enables consolidation of these funds, improving cost management and easing workflows for authors. However it is our expectation that there are very few institutions currently operating under model D, although many institutions may be in the process of setting up this approach.

2.3 APC workflows: what are institutions tracking?

Four workflows that related to APC tracking within the library were identified through the interviews. These workflows were:

- **Workflows related to research registration systems and repositories**
- **Workflows related to publishers' deals (transformative and fully OA agreements)**
- **Workflows with regard to the management of the OA fund**
- **Workflows with regard to institution-wide tracking of APCs ('tamed' and 'wild')**

As noted above, not all institutions are operating under the same model at this time, and there is variance both in their motivation for OA monitoring and in their capabilities to do so. In order to harness the opportunities offered by APCs currently 'in the wild', more focus is required on workflows to monitor beyond the 'tamed' institutional OA spend to capture 'wild' APC payments. In other words, to track those payments made directly from research grants, from researchers' discretionary funds or, where – because of distributed payments across institutions – the payment is harder to track.

We see a complex and challenging role for institutions in managing a complete picture of APC spend; however there is, in many cases, an increasing desire to do so

2.3.a Workflows relating to research registration systems and repositories

Many university libraries have a research registration system and/or an institutional repository, with procedures in place to capture articles by authors of the institution, mostly in the framework of a Green OA policy. Nearly all (14/16) interviewees had institution-wide repositories in place at their institution and had workflows for tracking articles from the institution. In some cases, the workflow also supported tracking of OA and APC payments. One university library has made use of the procedures around the institutional repository for APC payments in the following way:

1. **Notification**: all lead authors affiliated with the university should notify the library as soon as an article or conference proceeding is accepted. This is a mandatory procedure. The authors can simply forward the email from the publishers notifying them of acceptance. A copy of the author's accepted manuscript should be included. The author's version should contain most of the information needed to address OA requirements (funder name and award reference, journal name, title of article). The interviewee states that about 80% of lead authors comply with this mandatory notification procedure.

2. **Triage**: the library checks the article and the possibilities with regard to Green or Gold OA with a typical two-day response time. Depending on the requirements of the author's research funder and the options – if any – to pay the APC, the author will be advised that either their APC will be covered, or where there are no requirements or no funds, usually the Green route will be advised. In these cases, the author's manuscript will then be deposited in the institutional repository with an embargo.

3. **Service to authors**: the library takes on the responsibility to comply with research funder policies, saving the researcher time and effort. This is very popular among researchers at the institution.

Another interviewee described a research registration system that aims to register all publication metadata from the institution. From the registration system, an annual report is produced about all publications with authors from the university for the national association of universities. It is noteworthy that the papers registered by these systems form the basis for the annual evaluation interviews with the researchers within the university. However, this report is less useful for evaluating the OA policies by the university itself as there is no

distinction between corresponding authors and other authors, and the institution in this case will only pay APCs on behalf of a corresponding author. Internally, the library is now planning to make such a distinction in order to have an adequate OA monitoring tool.

2.3b Workflows related to the management of OA funds (including block grants)

All but three of the 16 interviewees had responsibility for managing APC funds, either funded centrally from the institution or in the UK via block grants from the research councils. In these cases, increased tracking of payments is in place, often going beyond monitoring APC funds issued by the library (such as discretionary funds used by individual authors). As one interviewee commented, "you can describe the OA fund as a starting point for analysing the needs within the campus with regard to OA", indicating the increased focus for these institutions on understanding OA publications from the university as a whole.

Block grants:

- One UK interviewee will arrange the APC payment from two block grants from the research funders (UKRI and Charity OA Fund) or alternatively will contact another research funder to confirm that the APC can be prepared by the library and will be reimbursed later by the research funder. If there is no grant money left or no other funding source available, normally the Green route will be advised. However, the researcher can use his/her discretionary budgets for paying the APC. The institution uses an accounting code in the university's financial system to monitor these payments

Institutional OA funds:

- An OA fund managed by one European interviewee was started two years ago with the aim to stimulate Gold OA publishing for articles that did not fall under publishers' deals and could not be financed by other budgets (such as a research funder grant). The fund was originally meant for authors from specific faculties, but this has recently expanded to include additional faculty, and additional funds from these faculty have been provided. The fund is managed by the interviewee and a colleague. He describes the working process as follows:
    - The fund finances 100% of the APC as long as there is money in the fund. In the first two years, this has always been the case as not all the money has been spent
    - The fund only finances APCs from corresponding authors of the university and for articles yet to be published (i.e. APCs are typically not paid retrospectively). However, if the author has prepaid the APC from his/her personal funds, the fund will reimburse the APC. This happens very rarely
    - About half of the requests for funding of APCs are already covered by publishers' deals, which illustrates the difficulties in communicating the availability of OA publishing options to researchers
- One UK library has its own OA fund in order to support publication in fully OA journals. This enables it to support unfunded research APCs and OA publications from centres or teams that do not typically have access to research grants
- One European academic library also pays APCs for articles by institutional authors in fully OA journals, although the fund is not formally positioned as an OA fund. The library pays APCs from their budget with the aim to make it as easy as possible for authors. The authors have to send an email with the question 'will you pay for this?'. Payments are only made for fully OA journals that are listed in DOAJ, however the institution reports positive feedback from authors who are grateful when the APC is paid and accept the explanation why APCs for hybrid journals are not paid
- Another European library operates an OA fund for about 300 articles per year, covering 100% of APCs for fully OA journals, and 50% of APCs for hybrid journals, providing the journal fulfils certain national criteria
- A US university library operates an OA publication fund made up of money from the

library collection budget and from other budgets from the university. Only fully OA articles are funded and only if no alternative funding is available. The fund has an APC price cap of $3,000. Articles with co-authors from other institutions are supported with the prorated proportion of the APC
- Another US university library operates an OA publication fund with a price cap for APCs in fully OA journals of $1,500. They also compensate APCs in hybrid journals up to $750. The OA fund is only available for research articles where funds are not available through grants and other financial sources. In practice, a large part of the applicants to the fund (about 40%) are early career researchers, such as PhD students or postdocs

2.3c Workflows related to publishers' deals (transformative and fully OA agreements)
Transformative agreements with publishers have been implemented at a number of the institutions we spoke to (10/16 institutions). The result of an increasing number of publishers' deals is an increased library share for OA spend. One interviewee noted that for their institution where eight new publisher agreements were made in 2018 and more agreed in 2019, over 75% of the journals where authors from the institution would publish would be covered by the university library.

However, one challenge noted by interviewees was that each publisher's deal has different features and conditions, which complicates workflow procedures. Not only is the content of the publishers' deals different, but also the workflows between the publishers on the one hand and the libraries on the other. One interviewee, the Vienna University library, published an article in 2018 that outlined the particular issues experienced with different publisher deals, including different methods of author identification, checking eligibility, monitoring specific funder information (in this instance, tracking FWF-funded publications), and ensuring good author experience.[27] The interviewee confirmed that since the publication of the article, a number of publishers had made improvements to these workflows.

Transformative agreements were also acknowledged as simplifying workflows. One respondent stated that most eligibility checks for their transformative agreements are carried out by the publishers without the involvement of the library. Only where the publisher is unable to verify eligibility, the library is involved and will carry out an eligibility check itself.

One library has recently concluded a transformative agreement with a publisher for 2020, which will implement the following workflow:

- A part of the APC of an OA publication in a hybrid journal will be covered by the transformative agreement, and therefore financed by the library.
- For the rest of the APC there are two options:
    - The author has a research grant: in this case the author will be asked to pay the rest of the APC
    - The author does not have a research grant: in this case the rest of the APC will also be financed by the library as part of the transformative agreement
- This workflow uses the RightsLink for Scientific Communication system provided by the Copyright Clearance Centre (CCC). This was recently developed with the aim of helping publishers to model and support a variety of deals. From the author's perspective, he/she will see a workflow within this RightsLink system when his/her article has been accepted and his/her affiliation is recognised as eligible for this agreement. With the OA publishing option, the author sees that the APC is partly paid by the library, and he/she can indicate if there is grant money available for paying the rest of the APC. If not, the workflow will show that the full APC will be financed by the transformative agreement with the library.

27. Pinhasi, R., Blechl, G., Kromp, B. and Schubert B.. 2018. The Weakest Link – Workflows in Open Access Agreements: The Experience of the Vienna University Library and Recommendations for Future Negotiations. Insights the UKSG journal, 31(27). Available at: http://doi.org/10.1629/uksg.419 [Accessed February 29, 2020].

The library hopes to establish more transformative agreements with publishers using a similar distribution of APC payments between the library on the one hand and the research grant holder/research funders on the other. The challenges of introducing transformative agreements are manifold, however, with infrastructure and workflows being just one challenge. One interviewee commented "I guess many other librarians are worried about the financial consequences and probably would like to see a few examples of how this will work out". This brings us to the thorny issue of monitoring a full picture of all institutional APC payments, including 'APCs in the wild'.

2.3d Workflows with regard to institution-wide tracking of APCs

As previously noted, for APCs where funds are managed by the library or institution directly, or where these form part of a publisher agreement, payments can be easily monitored and tracked, and there was clear motivation from the institutions interviewed to have a view on the funds being distributed. A much smaller number of our interviewees had implemented methods of tracking institution-wide APC payments, including those APCs paid 'in the wild'. The motivations now extend beyond monitoring the distribution of directly administered funds to understanding the complete picture of OA output and expenditure, in order to facilitate a transition to OA.

These institutions seek to understand what funding is available beyond the institutional library budget, to track the costs, and to increase efficiency in the management of OA payments. They also wish to be able to negotiate publisher agreements more successfully by having a complete picture of spend. As one interviewee commented, "There's a prevailing philosophy that APC costs should be transparent." There is a significant risk in not taking this approach: institutions or consortia negotiating a transformative agreement without a comprehensive picture of APC spending outside of the library budget may find, once an agreement is in place and communicated to researchers, that there is a much higher volume of APC payment requests from authors who may previously have paid these APCs using other sources.

The estimates of how many 'wild' APCs there are for an institution varied considerably across our interviews:

- One interviewee (with institution-wide APC tracking over several years) has been able to track more than 95% of all APCs
- Another interviewee, with a similar well-established system to monitor OA publications and APCs, estimates that they cover the vast majority but "evidence is hard to collect"
- A third interviewee notes that there is a feeling that the central team sees the majority of the APCs actioned at the university, but again that evidence is difficult to collect. In particular, researchers in medicine and health often pay directly for their own APCs
- Another interviewee - with a central OA fund - thinks they cover about 15 to 20% of the APCs. This is based on a search in a bibliographic database where many articles were found that were published OA by authors of the institution but were not covered by the central fund
- Another interviewee - from the library with an OA fund and no publishers' deals - thinks the vast majority of APC payments by authors of the university fall outside their range

Based on the findings from authors explored in part one of this whitepaper, it is unsurprising that there is such variation amongst interviewees in how much is tracked, given the complex sources of funding seen globally. It is evident that institutions beginning to grapple with APC monitoring outside of managed funds are doing so to increase their negotiating power and to better facilitate the uptake of OA. One respondent states that his library has proposed an

OA program to the governing board of the university which includes an increase in the number of transformative agreements in the coming three years. At the end of these three years, the library expects to cover about 75% of the articles authored by researchers in their university.

2.3e Estimating overall expenditure

A number of interviewees reported using bibliographic databases to undertake OA monitoring.

- **Monitoring OA articles**: several interviewees from university libraries indicated that they compile an annual report on the number of OA articles by their institutional authors based on data from bibliographic databases. Mostly, the database used for this purpose is Web of Science, as this database has metadata drawn from Unpaywall to distinguish the corresponding author and recently also includes metadata on the OA status of articles. It should be noted that this method may not report a comprehensive picture for Humanities and Social Science research

- **Checking missed APCs**: each year, one institution compiles a bibliometric report of all articles affiliated with the university, using Web of Science, Scopus and the institutional repository. They are able to generate a total number of OA articles, using a matching process based on the DOIs of OA articles (hybrid or fully OA) compiled from publishers' deals and from APC tracking. The respondent also uses this report to find OA articles with APC payments that have not been included in the regular APC tracking. This is only a limited number of articles every year

- **Calculating potential costs of APCs**: a similar approach has been used in a recent project by Australian University Libraries.[28] This project aimed to quantify the volume of APC payments on behalf of institutional researchers of six universities. The reason for this study was to get a better understanding of the budgetary implications of transformative or other OA agreements with publishers. In this project, metadata from Web of Science and Scopus were matched with data from Unpaywall in order to identify Gold OA articles. Next, APC list prices were added to the data in order to calculate the total APC costs per institution. This analysis showed that the faculty members spent an amount of money on APCs equivalent to 25% of the library budget for subscriptions and that this amount has increased by 15 to 20% every year in the last three years

2.3f Examples of success

The range of feedback shows the challenges in successfully tracking 'APCs in the wild'. Many interviewees pointed to the "bureaucratic headache" created by such monitoring. One interviewee commented "we are on the path to creating an enormous workload including a massive increase in administrative load", and that the chief obstacle for tracking payments is simply "manpower within the library". A few institutions have made some progress, however:

- **Accounting codes**: a number of university libraries have introduced an accounting code for APC payments in the financial system of the university (alongside an accounting code for other publication charges). Two university libraries reported positive results using these accounting codes to track where APCs are financed by other budgets (research grants or institutional budgets) and by which budgets they are paid. However, where another library made efforts to introduce the consistent use of accounting codes in the university's financial system, this proved to be impractical. The reason why accounting codes are successful at some institutions and not at others is not known. One crucial success factor appears to be the number of employees within the university that are involved in booking APC payments. If this

28. Cramond, S., Barnes, C., Lafferty, S., Barbour, V., Booth, D., Brown, K., Costello, D., Croker, K., O'Connor, R., Rolf, H., Ruthven, T., Scholfield, S.. 2019. Fair, Affordable and Open Access to Knowledge: The Caul Collection and Reporting of APC Information Project. Proceedings of the IATUL Conferences. Available at: https://docs.lib.purdue.edu/iatul/2019/fair/2 [Accessed February 29, 2020].

number is limited, this approach appears to be more successful. This is corroborated by other interviewees who stated that it would be practically impossible to get everyone within the university system to implement an accounting code for APCs in a consistent and uniform way

- **Payment hub**: one library has proposed to implement an APC payment hub to centralise APC payments for the entire university in order to make efficiency gains, calculating that APC payments outside the library by researchers within the university amount to approximately €265,000 per year. The library has now proposed to the governing board that the library will function as a payment hub for those APC payments. Such a centralised payment hub should allow efficiencies for the university as a whole and enable the library to negotiate better conditions and discounts

2.4 Beyond administering OA payments monitoring: further considerations for institutions

From our interviews, it is difficult to establish a clear estimate of the total time spent on monitoring APCs or associated responsibilities due to distributed responsibilities within each institution. Where workflows relating to research registration systems and the institutional repository might be in one team, the OA fund may be managed by another, and workflows for publishers' deals in yet another. Only two respondents were able to give an estimate of the human resources needed for the combination of monitoring agreement licenses, managing the OA fund and tracking APCs. Their estimates varied from 1 FTE to 2.5 FTE. Several interviewees highlighted further considerations within the institution for OA management:

2.4a Reporting requirements

Additional reporting responsibilities were noted by several interviewees. In particular these include expectations from funders (such as UKRI and COAF in the UK, who require periodic reporting on block grant expenditure). In some cases, failure to submit an appropriate report in the specified timeframe could result in grant monies being withheld by the funders going forward. Compliance reporting either nationally or within the institution, and other internal reporting requirements were also mentioned.

2.4b Author engagement

Described by one interviewee as "missionary work", the role of the institution in undertaking OA outreach and engagement was noted by a number of institutions. Whilst some institutions have implemented tools to support authors in choosing OA (such as a journals browser in the Netherlands),[29] this can be challenging. For example one interviewee commented that the sheer number of researchers in the university (over 6,000) and the turnover of these researchers made it practically impossible to inform all authors within the university about all existing options to publish OA articles.

Some interviewees noted a slow change in culture and attitude as more researchers learn about OA, especially where there is a dependency on how research is evaluated. For example in the UK, OA is part of the Research Excellence Framework (REF), which is the national system for assessing research excellence.[30] One interviewee noted this is "making researchers more responsive to OA".

2.6 Looking ahead: the future of APC monitoring and tracking

From the workflows and responsibilities outlined so far, we see a complex and challenging

APC tracking method at one library:

1. **Accounting code:** in the local accounting system of the university, two new accounting codes have been introduced: an accounting code for the APC and an accounting code for additional publication charges like page and colour charges. In making payments through the local accounting system, one of the requirements is to record the funding source if applicable. So, for the majority of APC invoices paid, the funding source is known. These accounting codes have been in place since 2016
2. **Invoice checking (monthly):** based on the accounting code, APC invoices are pulled out of the system monthly in order to perform a check on the invoice and the data contained by the invoice. This work is done by the library's business controller and published in a spreadsheet
3. **Review and adding data by the librarian (monthly):** all invoices extracted from the financial system are reviewed again and information such as the DOI, journal title, hybrid or fully OA article, will be added to the spreadsheet. This step will be time-consuming but is only required in case of insufficient metadata contained within the publishers' invoice
4. **Annual check:** before the annual reporting of OA publishing costs, an overall check will take place using a bibliometric report for all OA articles with university researchers as corresponding authors

29. Quality Open Access Market, Journal Market. Available at: https://www.qoam.eu/journals. [Accessed February 29, 2020].
30. Research Excellence Framework, November 2019. REF 2021: Overview of open access policy and guidance. Available at: https://www.ref.ac.uk/media/1228/open_access_summary__v1_0.pdf. [Accessed February 29, 2020].

role for institutions in managing a complete picture of APC spend; however there is, in many cases, an increasing desire to do so. As noted throughout this whitepaper, by building a clear picture of the complete APC landscape, and by consolidating funds from multiple sources, institutions can increase the efficiency of managing a growing number of OA payments, and can ensure adequate support for an OA future with an increasing number of Gold OA policies now in place. Our interviewees commented on some of the key changes and likely impact these would have for them in the future.

2.6a Increased transformative and fully OA agreements

As previously noted, a number of institutions anticipated a greater number of OA agreements in the coming year, with library budgets taking on an increased share of OA publication costs. A positive outcome of these deals is the subsequent effect on APC tracking: these interviewees expected that an increase in genuinely transformative publisher deals would help to counter the heavy workload associated with managing a growing number of individual APC payments. As more APCs are managed via a central agreement, the number of micro payments (or individual APC invoices) will be reduced, and the number of individual APCs that need to be tracked by a separate accounting code therefore diminishes. There may still be a residual amount of APCs left outside of this, but certainly the work would be less.

Interviewees highlighted specific improvements they would like to see from publishers as the number of agreements increases. Their suggestions focus in particular on the **ease of selecting OA for authors**. Some interviewees pointed to the sometimes "cryptic" terminology used by publishers, as well as confusing workflows that are unclear about whether an invoice needs to be paid or if it will be covered by an agreement, leading to higher levels of authors choosing to opt out of OA than is desirable. As one interviewee put it, "Publishers could help by revamping their systems to make processes as frictionless as possible." In practice, this means making workflows clear for authors so they can see their APC is covered by their institution, and making the language clear and consistent across publishers. One interviewee proposed that a standard for submission and acceptance processes with regard to OA publishing options should be developed.

Institutions also want to see **better data from publishers**, with one interviewee commenting "the lack of transparency in the data makes it challenging to make informed decisions about the transition to OA". The crucial moment of OA publication is at submission/acceptance of the article. This is a process that takes place between the author and the publisher, so the library is dependent on the publisher or author to provide timely information to them. Interviewees emphasised that publishers should inform the library each time an institutional author submits an article and it is accepted. The desire for a publisher dashboard, providing institutions with regular updates on the status of submissions, was mentioned by more than one interviewee. One interviewee also mentioned that they would also utilise such a system in tracking multiple submissions from individual authors, as this would allow the library to cap APC requests from one individual, for example to three per year. Specific comments on data requirements from publishers included:

- **Improved metadata**: information on funders and affiliation, licence type, and information about the article on APC publisher invoices could be improved. One respondent points to the ESAC recommendation about this topic.[31] In addition, discounts to the list price of the APC and the reason why (membership deals, editors' discount etc.) should be mentioned on the invoice

- **Better reporting for analysis at the institutional level**: one interviewee stated that some publishers provide data only at a consortia level, meaning this is difficult to analyse at the institutional level

31. ESAC, 2017. ESAC Workflow Recommendations for Transformative Agreements. Available at: https://esac-initiative.org/about/oa-workflows/ [Accessed February 29, 2020].

- **Interoperability of publishers' systems and library systems**: some respondents noted the communication between the publishers' systems, the internal accounting system of the university and the library system as one of the biggest challenges

- **Author manuscript identification**: one challenge highlighted by some interviewees is in tracking author manuscripts where DOIs are not attributed until later in the publication process. Earlier availability of a unique identifier for author manuscripts would greatly improve the above-mentioned communication problems between the systems involved

- **Currency**: at least one interviewee mentioned the availability of prices and invoices in their own currency

Not all interviewees are convinced about these agreements however, with some commenting that "librarians have their guard up and are suspicious" of the new transformative agreements coming through. One interviewee stated that his university will move to formalise its approach to OA: a governing body at the university has passed an OA resolution and endorsed the library's principles for journal negotiations going forward. It is clear that the APC route introduces increased workload, which is a significant complication at a time when staffing is under pressure everywhere. One point of note here is that the top 20 publishers accounted for approximately 70% of papers tracked by Web of Science in 2017.[32] There were more than 4,000 other publishers making up the rest of the papers. This long tail means that case-by-case APC payments will continue to exist, even at libraries where there are transformative agreements.

2.6b Policies and additional funds

A further factor that may contribute to developments in APC monitoring is the continued evolution of funder and institutional policies on OA.

In the UK, the government's new UK Research and Innovation (UKRI) OA policy is, at the time of writing, in consultation, with one UK interviewee noting that this might mean important changes for their institution. Elsewhere Plan S and further revised policies from funders are expected to be in effect from 2021 onwards. How these policies affect an institution's authors and their choice of journals, and how institutional funds are distributed, was unclear to a number of interviewees.

It is generally acknowledged that the growth of fully OA journals has created a market for APCs, and many of those APC payments have been financed directly or indirectly by research funders. UKRI and other major research funders have acknowledged this and there is an expectation that there will continue to be a greater connection between policy and associated funds for OA, as well as a greater connection made to bring together payment streams. We identified two mechanisms for bringing together payment streams in our interviews:

- **Research funders contribute financially to transformative agreements concluded by national consortia.** One interviewee reported that the national research funding organisations finance part of the national transformative agreements with fully OA journal publishers, which is logical based on the high volume of APCs 'in the wild' financed using research grants, as seen in our author survey. Another interviewee stated that their main research funding organisation participates in the National Consortium that concludes these transformative agreements.

32. Quaderi, N., Hardcastle, J., Petrou, C., Szomszor, M., February 2019. The Plan S footprint: Implications for the scholarly publishing landscape. Available at: https://clarivate.com/webofsciencegroup/campaigns/plan-s-footprint/. Table 1. [Accessed February 29, 2020].

- **APC costs are shared with authors who hold research grants**. A second method in which payment streams can be brought together is through a workflow mechanism within a publisher agreement, whereby APC costs are shared with authors who hold research grants. One interviewee explained that upon acceptance of an article, the author will see that within the OA publishing option, the APC will be covered in part by the library. The author is then presented with two options: if he/she is beneficiary of a research grant, the author will be asked to pay the rest of the APC. If not, the rest of the APC will also be covered by the agreement.

2.6c The impact of better systems/technology

Assessing the total cost of APCs is becoming easier with the development of new tools such as Unpaywall. The use of Unpaywall data within bibliographic databases such as Web of Science makes it much easier for university libraries to get an overall view of the Gold OA articles authored by the researchers of their university. Unpaywall is also developing a tool to address this specific question, Unpaywall Journals. These developments might help many libraries to assess the number of APCs 'in the wild' in their university and calculate the total costs of those APCs, however there is still a margin of error expected, where basing budgets solely on the Unpaywall data may not be entirely accurate.[33]

2.6d Equity in OA funding

There are emerging concerns about equity and ensuring that authors who cannot afford to publish are supported. OA has resulted in a set of unanticipated inequities. Last year one institution interviewed made their OA fund available to graduate students to extend the opportunity to benefit from OA publishing. They may also widen this to other key groups, to ensure the OA fund makes the biggest possible impact on those that need it most.

33. See for example the caveats given here, particularly those on corresponding vs. fractional authorship: Piwowar, H., 7 December 2019. Publishing costs (APCs). Unpaywall Journals Support Portal. Available at https://support.unpaywall.org/support/solutions/articles/44001822217. [Accessed February 29, 2020].

Summary and conclusions

Motivations for APC tracking

Having interviewed only a select sample of institutions, our research to date cannot meaningfully measure the global appetite for APC monitoring - this is an area we intend to explore further. What it does reveal however, is that tracking APC payments is a key concern for institutions on the path to an OA transition, whether driven by the policies of major research funders (model C in our framework), or stemming from an institutionally-led decision to transition (model D). Accelerating progress towards full and immediate OA is reliant on sourcing adequate funding to cover the costs of Gold OA, whether through individual APCs, fully OA publisher agreements, or transformative deals. In order to put the necessary centralised funding mechanisms in place to incentivise and facilitate author uptake, institutions require an understanding of existing funding for APCs, which as we have seen, is split across a complex range of funding sources and payment methods. Many of these remain difficult to monitor or track, with payments being made 'in the wild'.

Certain institutions have achieved success in monitoring APCs 'in the wild' via policies or accounting codes, however these approaches require a high level of coordination as well as investment

Complexity in the APC landscape

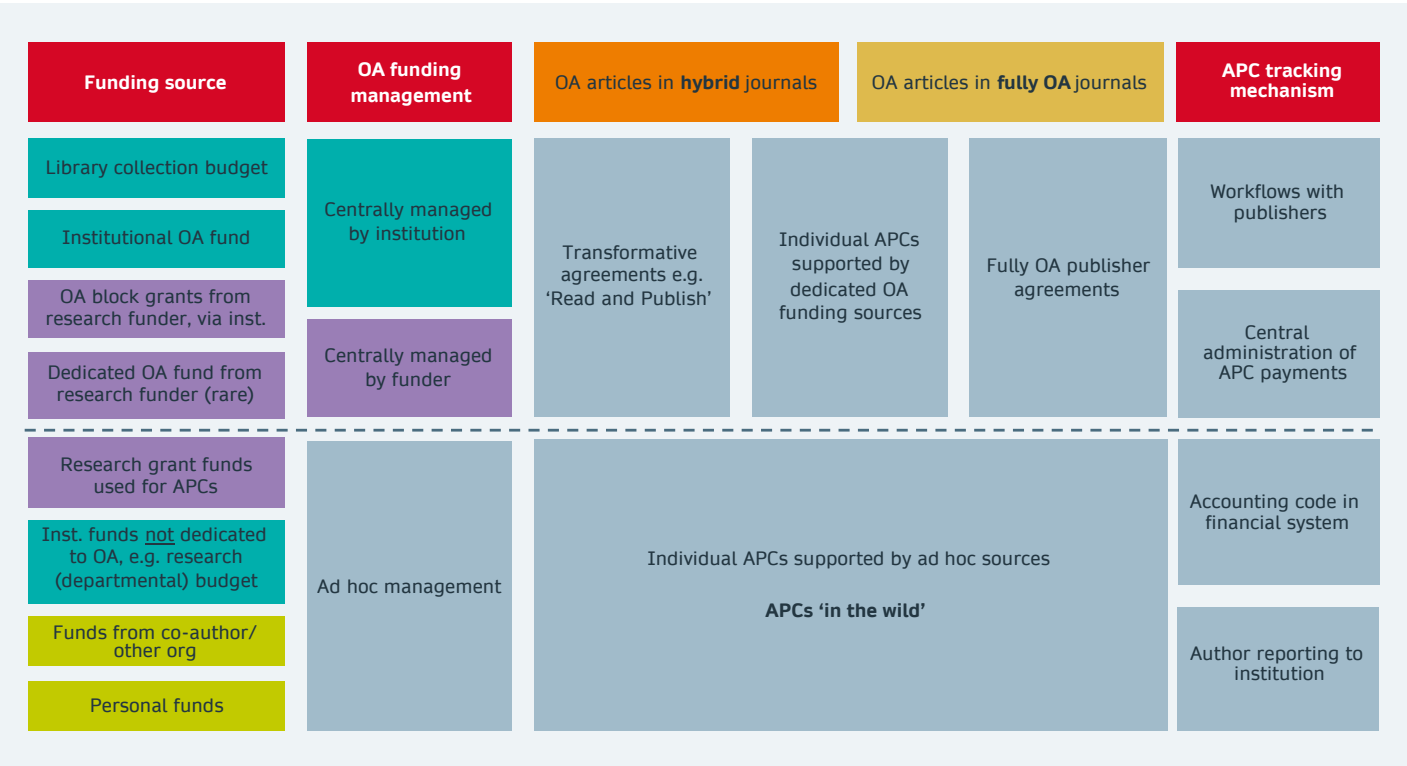


Figure 23. Diagram of APC funding, distribution and tracking mechanisms

As demonstrated by both our author survey and institutional interviews, the APC funding, payments and monitoring landscape is complex and varied. If we visualise the different funding sources and tracking mechanisms identified in our research (Figure 23), numerous different streams emerge. While some of these streams result in APC funding and payments that are centrally managed and monitored - 'tamed APCs' - many others result in APC funding and payments 'in the wild', which pose a real challenge for institutions seeking to gain a complete picture of OA funding sources and spending.

APC monitoring success stories

Certain institutions interviewed have achieved success in monitoring the majority of their APCs 'in the wild'. For some this is via policies that require authors to contact the library upon acceptance of their article for advice on OA funding options. For others this is through the creation of financial workflows that allow for identification of APCs via accounting codes. However, these approaches require a high level of coordination, as well as investment in resources to collate and augment the resulting data, on top of any resource required for handling centralised APC workflows such as OA funds or publisher agreements. A complete picture may be near impossible; for example, even when successfully implemented, accounting codes may struggle to capture the portion of payments that do not touch institutional systems. Nevertheless, the approaches showcased by our interviewees indicate that effective APC monitoring is achievable.

The role of research funders

A key insight from our author survey has been the fundamental role that research funders are already playing in supporting Gold OA publication for their grantees. 40% of hybrid OA authors and 59% of fully OA authors reported using funds from their research funder to support the cost of their APC. Because research funders are primarily supporting APCs via main grant funds however, it is likely that many funders have little to no visibility on the volume and value of Gold OA publication that they are currently facilitating. Where institutions and funders are seeking to effect a full transition to OA, this raises a number of issues. For funders seeking to support and incentivise authors in choosing Gold OA publication routes, an understanding of the proportion of their grantees' APCs currently being supported via their grants will be needed in order to estimate the likely budget required. For those institutions considering rationalising APC payments under agreements with publishers to enable greater efficiencies, it is often impossible for existing institutional budgets alone to cover the costs. As noted above, while existing subscription budgets may be used to enable transformative agreements for hybrid journals, these budgets do not exist in the case of fully OA journals. Moreover, for research intensive institutions the transformation of existing subscription spend still leaves gaps when seeking to cover the costs of publishing a high volume of research outputs.

Harnessing the financial support that is in many cases already being provided by research funders is one solution that has been posed. In addition to dedicated OA funds from research funders, such as the UK block grant system, this could be achieved via direct funder contributions to publisher agreements, as seen in the case of Springer Nature's agreement with the Bibsam consortium and four national Swedish funders. Alternatively it could be achieved via OA agreements that make use of contributions from authors' grant funds, as proposed by the University of California model transformative agreement.[34] Further models may also be possible, but are yet to be explored. APC monitoring, while challenging, enables funders and institutions to reach a better understanding of their shared contributions to the OA publishing system, and negotiate an approach that equitably spreads the costs of supporting a transition to full OA.

The role of publishers

The institutions interviewed delivered a clear message that publishers could play a vital role in enabling APC monitoring through the provision of better metadata regarding publications and payments. This is evidently an area where there is room for improvement. One positive insight from our interviews has been the impact of greater centralisation of OA payments through transformative agreements with publishers and other OA deals. Interviewees noted that as more OA articles are funded under such arrangements, the proportion of APCs 'in the wild' will decrease, enabling both greater efficiencies in payment, monitoring, and in helping authors to make their research openly available with minimal administrative effort.

34. University of California Publisher Strategy and Negotiation Task Force. 2019. An introductory guide to the UC model transformative agreement. Available at: https://osc.universityofcalifornia.edu/uc-publisher-relationships/resources-for-negotiating-with-publishers/negotiating-with-scholarly-journal-publishers-a-toolkit/ [Accessed February 29, 2020].

Further research

The insights obtained through our author survey and institutional interviews have proven extremely valuable in highlighting some of the challenges and success factors in enabling APC monitoring. As a next step, however, we recognise that further research is required to validate these findings, and provide a broader view of the extent and success of APC monitoring efforts being made by institutions worldwide. Our author survey demonstrated measurable differences in APC funding and payment approaches across different regions, and it would be valuable to compare this to a similarly global picture of institutional practices around APC monitoring. We will therefore be conducting a survey on APC monitoring, asking institutions to share details on the extent of their APC tracking, their motivations, barriers, and enablers, and seeking to understand the degree to which their institution's approach to APC monitoring fits within the framework of models A to D set out in this report. From this additional analysis we hope to be able to draw further insights into the factors required to better support APC monitoring, and the implications that this may have for driving an OA transition.

Appendix 1 – additional data from author payment survey

Fund type	Germany (55)	UK (40)	Rest of Europe (258)	North America (161)	China (mainland) + Hong Kong + Taiwan (78)	Rest of Asia (162)	RoW (66)
Dedicated OA funds from my main research funder (excluding OA block grants distributed via institutions)	9%	3%	5%	3%	1%	1%	9%
Dedicated OA funds from my main research funder, distributed via OA block grants to my institution	5%	23%	5%	1%	0%	4%	3%
Dedicated OA funds from my institution (excluding block grants from funders)	45%	43%	33%	16%	27%	25%	17%
The publication fee was fully covered by my funder/institution's OA membership with the publisher	5%	8%	10%	5%	15%	23%	14%
I used a budgeted OA allocation from my main research grant	18%	13%	19%	24%	41%	42%	15%
I used remaining funds from my main research grant (not dedicated open access funds)	24%	5%	24%	34%	41%	26%	21%
I used funds from my institution that were not dedicated OA funds	27%	13%	29%	34%	29%	26%	39%
Dedicated open access funds from an organisation that is not my main research funder/institution	18%	10%	10%	4%	9%	9%	5%
I used my own personal funds/ savings	4%	10%	12%	16%	32%	22%	15%
My co-author(s) funds (from their own funder, institutional or personal funding)	9%	5%	9%	10%	8%	12%	20%
Other (please specify)	4%	5%	3%	9%	1%	4%	5%

High Low

Figure 24. Fully OA funding sources by region - table format

Fund type	Europe (138)	ROW (56)
Dedicated OA funds from my main research funder (excluding OA block grants distributed via institutions)	7%	5%
Dedicated OA funds from my main research funder, distributed via OA block grants to my institution	12%	4%
Dedicated OA funds from my institution (excluding block grants from funders)	50%	25%
The publication fee was fully covered by my funder/ institution's OA membership with the publisher	42%	14%
I used a budgeted OA allocation from my main research grant	7%	38%
I used remaining funds from my main research grant (not dedicated open access funds)	5%	18%
I used funds from my institution that were not dedicated OA funds	10%	38%
Dedicated open access funds from an organisation that is not my main research funder/institution	7%	16%
I used my own personal funds/ savings	1%	16%
My co-author(s) funds (from their own funder, institutional or personal funding)	4%	9%
Other (please specify)	4%	11%

Figure 25. Hybrid OA APC funding sources by region - table format

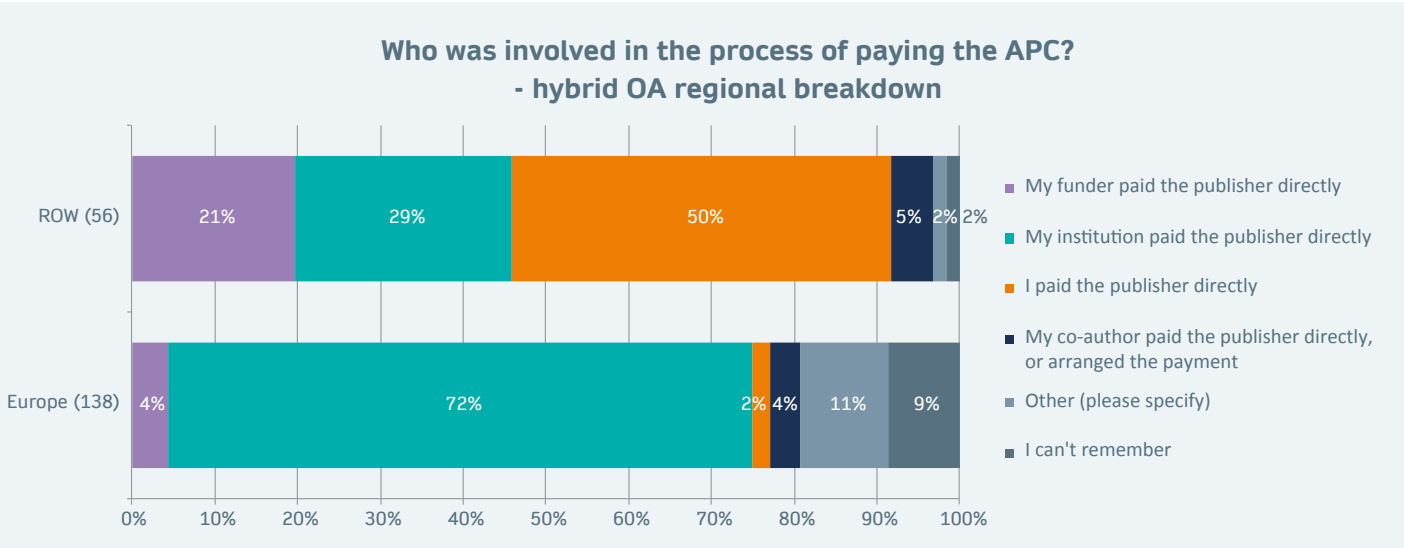


Figure 26. Who was involved in the process of paying the APC? Hybrid OA regional breakdown

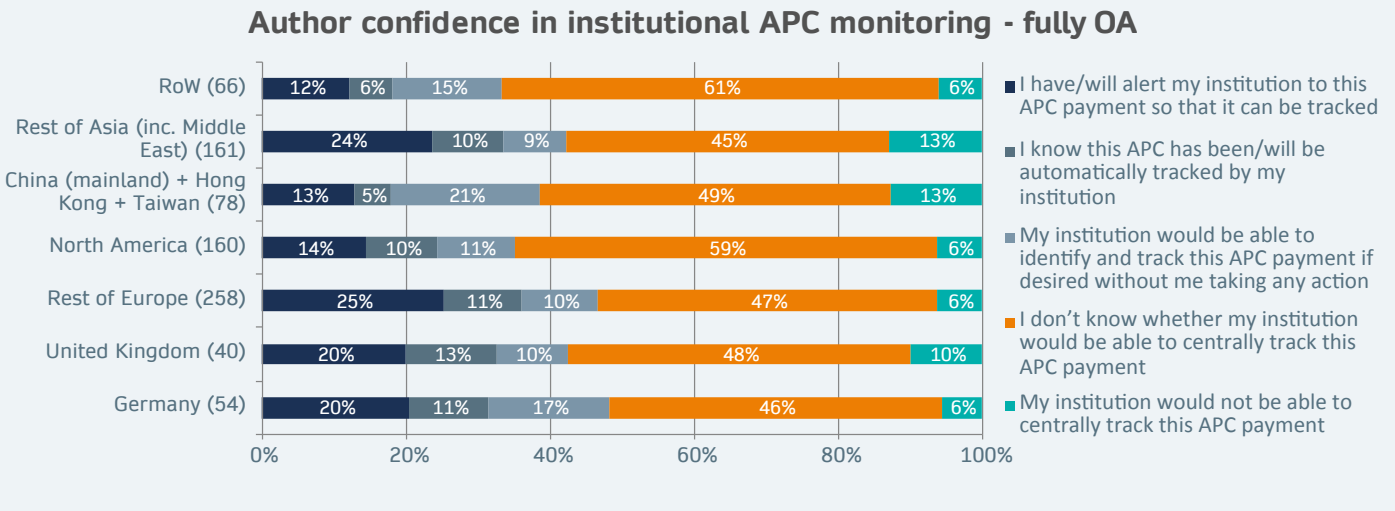


Figure 27. Author confidence in institutional APC monitoring - fully OA regional breakdown

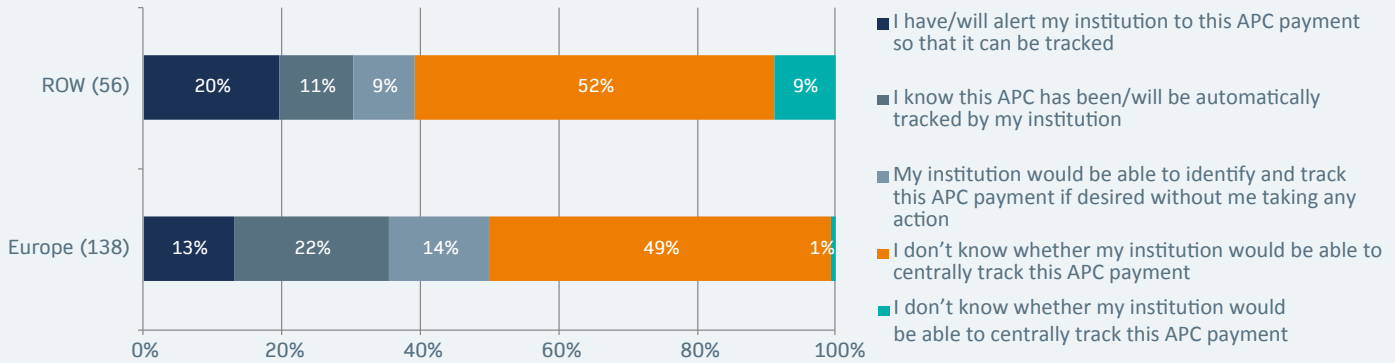


Figure 28. Author confidence in institutional APC monitoring - hybrid OA regional breakdown

Appendix 2 - Questions used in author survey

The following three questions were posed to Springer Nature authors who were taking part in the Post Publication Author Satisfaction Survey. For further details see the methodology section in Part 1 of this report.

Q. Which sources did the funding come from to cover the cost of the APC for this manuscript?

From main research funder:
Please select all that apply.

- I used a budgeted OA allocation from my main research grant (1)
- I used remaining funds from my main research grant (not dedicated open access funds) (2)
- Dedicated OA funds from my main research funder (excluding OA block grants* distributed via institutions) (3)
- Dedicated OA funds from my main research funder, distributed via OA block grants* to my institution (4)
- I did not use any funding from my main research funder (5)

From my institution:
Please select all that apply.

- Dedicated OA funds from my institution (excluding OA block grants* from funders) (1)
- I used funds from my institution that were not dedicated OA funds (2)
- I did not use any funding from my institution (3)

From other sources:
Please select all that apply

- Dedicated open access funds from an organisation that is not my main research funder/institution (1)
- The publication fee was fully covered by my funder/institution's OA membership with the publisher (2)
- I used my own personal funds/ savings (3)
- My co-author(s) funds (from their own funder, institutional or personal funding) (4)
- Other (please specify) (5) _____
- I did not use any other sources of funding (6)

Q. Who was involved in the process of paying the APC?

Please select all that apply

- My funder paid the publisher directly (1)
- My institution paid the publisher directly (2)
- I paid the publisher directly (3)
- My co-author paid the publisher directly, or arranged the payment (4)
- Other (please specify) (5) _____
- I can't remember (6)

Q. We are interested to understand how easy it is for institutions to identify and monitor APCs. Which one of the following options apply to you?

- I have/will alert my institution to this APC payment so that it can be tracked (1)
- I know this APC has been/will be automatically tracked by my institution (2)
- My institution would be able to identify and track this APC payment if desired without me taking any action (3)
- My institution would not be able to centrally track this APC payment (4)
- I don't know whether my institution would be able to centrally track this APC payment (5)

Explanation displayed if respondents hover over words "block grant": *Block grants: Certain research funders award OA block grants to institutions, to be distributed to eligible researchers to fund their APCs.

Appendix 3 - List of interviewees

Country/region	Institution	Interviewee(s)
Australia	University of Queensland	Julie Oates; Elena Danilova
Australia	University of Wollongong	Margie Jantti
Austria	University of Vienna	Brigitte Kromp
China	Fudan University	Chengmin Shao
Netherlands	Erasmus University Rotterdam	Leonidas Pakos
Netherlands	Delft University of Technology	Just de Leeuwe
Norway	University of Bergen	Paul Simon Svanberg
Sweden	Stockholm University	Lisa Lovén
UK	University of Glasgow	Valerie McCutcheon
UK	Imperial College London	Ruth Harrison
UK	University of York	Thom Blake; Derryn Robins
USA	Iowa State University	Curtis Brundy
USA	IUPUI - Indiana University - Purdue University Indianapolis	Jere Odell
USA	University of California	Matthew Willmott; Anneliese Taylor
USA	University of Florida	Perry Collins
Qatar	Qatar National Library	Sarah Abu Saada ; Lama Abuhasanain

Appendix 4 - Institutional interview questions

A. APC handling at your institution in relation to 'APC's paid in the wild': general policies and instruments

1. Is your institution handlig and tracking payments for APC's at the moment?

	Yes/no	Remarks
Institutional funding sources/funds handled by the institution		
dedicated OA funds/APC funds of the institution		
institutional budgets that are not dedicated to OA		
institution's arrangements with the publisher [membership; offsetting deal; read & publish license]		
block grants from research funder distributed via the institution		
Research funding sources		
OA allocations from a research grant		
funds from a research grant not dedicated to OA		
funder's arrangements with the publisher		
'Other' funding sources		
author's personal funds		
co-author(s) funds		
OA fund from a third party		

2. What approach is used in order to track OA articles and their costs?

3. A. Which funding sources for APC payments are difficult to track by your institutions?
   B. Do you have an estimate of how many APC payments (number or percentage) you might be missing?

4. For which purposes your institution is tracking APC-payments? [compliance, negotiation, other). [For each purpose, please explain the consequences if the tracking is incomplete]

5. What are the reporting requirements with regard to OA articles and APC monitoring? [Are there funders that require regular reporting?].

6. How is your institution/university making authors aware of APC funds?

B. What are the main issues and obstacles in tracking APC payments, especially with a view on the APC payments in the wild?

1. How many resources are spent by your institution on tracking APC payments now [resourcing, finances, ….]?

2. A. What are according to you the main challenges with regard to the workflows concerning APC-payments tracking by your institution?
   B. What kind of solutions do you envisage regarding these challenges?

3. How does your institution/university handle issues such as (see table below):

Corresponding authors with multiple affiliations
Co-authors (form other institutions) sharing the APC costs
Tracking costs where discounts (e.g. due to OA memberships) are applied
Tracking costs for hybrid versus fully OA article publications
Currency conversion / fluctuations
Different metadata standards
Tracking costs where the institution arranges payment, vs. where author pays the publisher directly (if applicable)
Validating requests for reimbursement of APCs to authors (if applicable)
Other issues
author's personal funds
co-author(s) funds
OA fund from a third party

C. Role of other stakeholders

1. What can other stakeholders (such as funders, publishers and authors) do to alleviate the administrative burden of APC tracking for institutions, especially with regard to 'APC's in the wild'?

2. Do you share the APC expenditure data with third parties, such as other institutions, consortia, research funders, public datasets (e.g. open APC)?

D. Future developments

1. What do you see as the most important developments with regard to APC-payment tracking in the near future within your institution as well as with regard to the other stakeholders (such as research funders, publishers, authors)?

2. How does APC tracking relate to the evolving OA policies in your institution/ university and/or in your country?

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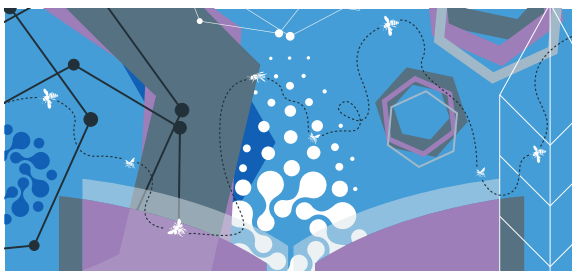
Acknowledgements

Along with our interviewees (listed in Appendix 3) and authors who participated in our survey, we would like to thank the following Springer Nature colleagues for their contributions to this whitepaper:

Carrie Webster, VP Open Access
Roza Sakellaropoulou, Marketing Manager
Lucy Frisch, Senior Marketing Manager
Fariba Soetan, Policy & Development Manager
Emma Goldsmith, Research & Development Officer
Caroline Nevison, Director Institutional Sales, Europe
Arend Kuester, Director Funder Relations
Katie Baker, Head of Communications
Susie Winter, Director, External Communications & Engagement
Steven Hurst, Senior Marketing Manager
Isabel Roth, Marketing Manager
Jovial Toh, Marketing Manager
David Lamb, Associate Marketing Manager
Angela Timmerman, Global Institutional Customer Engagement Director
Christel Bennett, Director of Global Content Marketing
Johanna Kuhn, Institutional Engagement Manager
Lillian Zhang, Institutional Engagement Manager

Authors
Jessica Monaghan, Head of Policy and Performance, Open Access, Springer Nature
Mithu Lucraft, Marketing Director, Outreach and Open Research, Springer Nature
Katie Allin, Senior Research Analyst, Springer Nature
Maurits van der Graaf, Pleiade Management & Consultancy
Tracey Clarke, Tracey Clarke Consulting

Around our complex and interconnected world, the research community is advancing discovery for all of us. These illustrations celebrate some of the great minds who have helped advance discovery through history.



Jean-Claude Bradley (1969–2014)

Jean-Claude Bradley was a chemist and passionate proponent of Open Science. Following an early career in patent driven nanotechnology, Bradley came to believe that the work he was doing wasn't having the impact or benefitting mankind in the way he had hoped. At Drexel University, working on antimalarials, he coined the term Open Notebook Science for an approach which aimed to make the details and raw scientific data of every experiment done in the lab freely available within hours of production. Bradley was founding Editor-in-Chief of *Chemistry Central Journal* and a founding Editor of the *Journal of Cheminformatics*. In 2007 he was awarded a Blue Obelisk award for achievements in promoting Open Data, Open Source and Open Standards.