



# OA in physics: researcher perspectives

August 2022



IOP Publishing

OPTICA  
PUBLISHING  
GROUP  
Formerly OSA

# Introduction

Scholarly publishing is in a period of acceleration towards an open science future. In order to best support the scientific communities we serve, AIP Publishing, the American Physical Society (APS), IOP Publishing (IOPP), and Optica Publishing Group (formerly OSA) commissioned research to better understand and meet the needs of the physical sciences community as they relate to OA.

The physics community is no stranger to open science practice. Early sharing of preprints via arXiv was first established more than 30 years ago, while the growth in OA articles in the physical sciences has been more than 25% a year over the past decade, compared with an overall average annual growth in physics articles of around 2%<sup>1</sup>.

However, although there has been considerable progress in establishing a wide range of fully OA journals for physics, more than 85% of all physics articles<sup>1</sup> continue to be published in hybrid journals, with authors' ability to fund gold OA articles differing significantly by geography and career stage. The focus of this new study was therefore to examine the needs of the physics community with regard to OA, and inform the policy approach needed to support all researchers across the physical sciences. Strategies that limit researchers to only publish their results in fully OA journals, or that undermine the viability of high-quality hybrid journals through zero embargo policies, could result in physics researchers no longer having an adequate range of options or freedom of choice in where they publish their work. The four societies involved feel that exploring and acting on their feedback will be critical to enabling success for all in this transition.

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<sup>1</sup>Data sourced from Dimensions, an inter-linked research information system provided by Digital Science. [www.dimensions.ai](http://www.dimensions.ai)

## Research methodology

Over 3,000 physical science researchers from across the globe participated in an online survey distributed by all four society partners to their researcher communities between December 2021 and January 2022.

**Most regions, subdisciplines and career stages are represented in the responses:**

### Geography

**Most respondents:**

**31%**

UK and Western Europe.

**22%**

North America.

**Fewest respondents:**

**2%**

Australasia.

**5%**

Central/South/Latin America.

### Career role and stage

**45%**

lecturers/professors  
with a research focus.

**41%**

more than 16 years'  
experience.

**21%**

1–5 years' experience.

### Fields of study

Respondents represented a broad range of physical science research areas.  
Most respondents:

**27%**

Optics and photonics .

**19%**

Condensed matter.

## Our findings

### Gold OA uptake in physics

Approximately half of respondents have published between one and five gold OA articles over the past five years.

**14%**

have not contributed to any OA articles within the past five years.

**52%**

have contributed to 1–5 articles.

**17%**

have contributed to 6–10 OA articles.

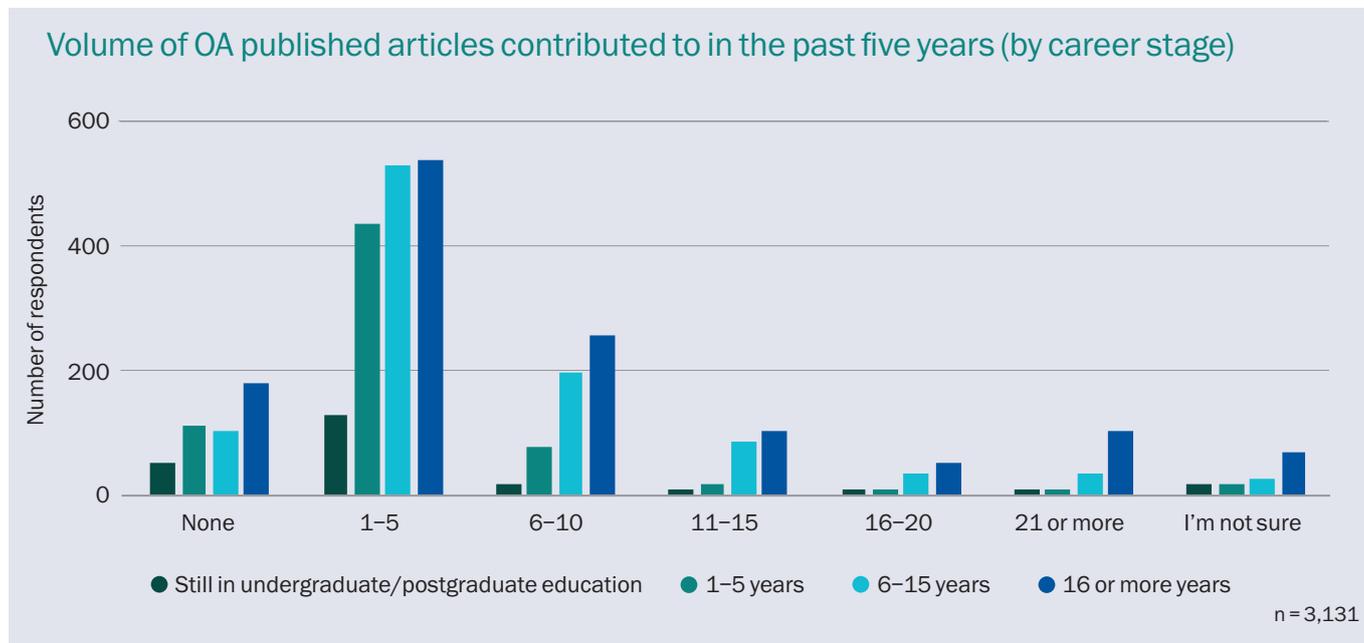
n = 3,128

A Dimensions database search of all 2021 published articles in the physical sciences shows that of 266k articles, approximately 181k were classed as openly available, of which nearly 81k were gold OA articles in fully OA journals and a further 13k were published as gold OA articles in hybrid journals<sup>2</sup>.

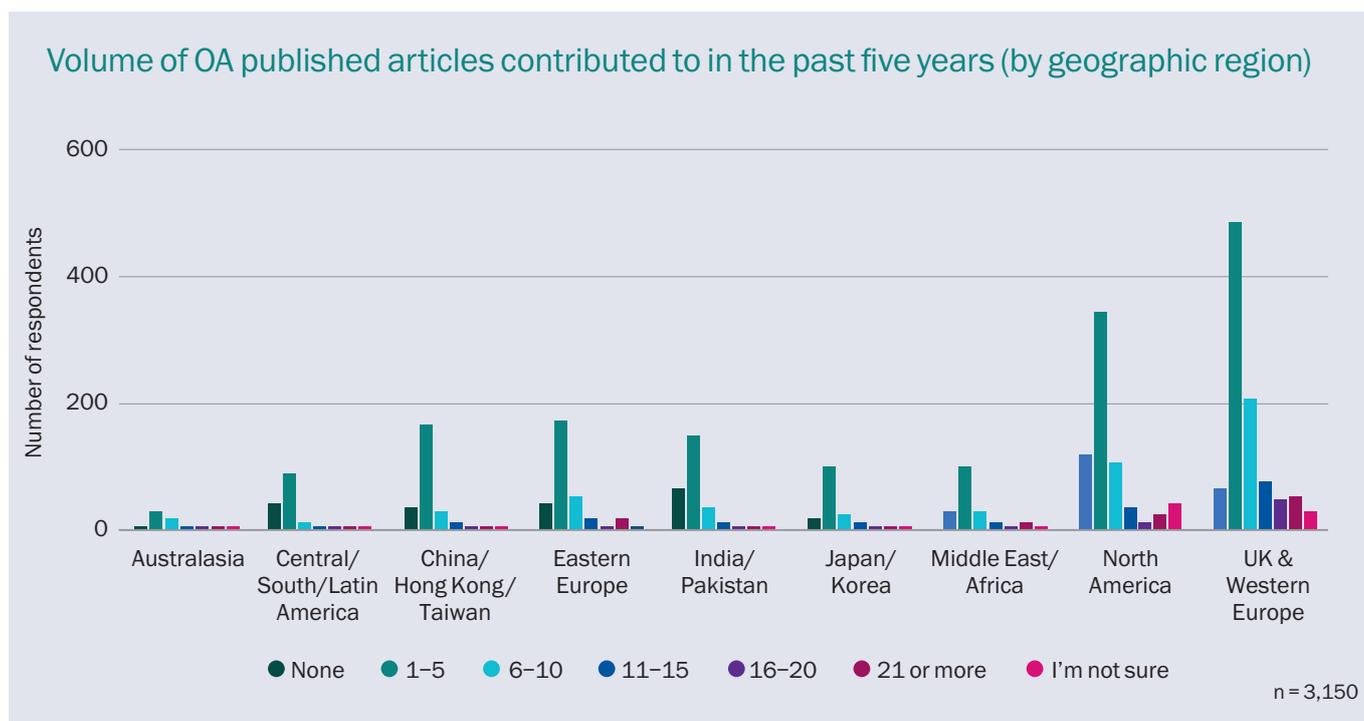
### Who is publishing gold OA in physics?

There is a somewhat linear relationship between career stage and OA uptake in the survey results, with those still in education or the earliest stages of their career having published fewer (or no) OA papers in the past 5 years. As the survey data does not indicate total article outputs, only OA, it is difficult to conclude whether this represents lower uptake of OA by more junior researchers, either as a result of inclination or access to funds, or simply that this cohort publishes fewer papers overall. Further, co-authorship or collaborations can confound the evidence here, inflating the numbers for more senior researchers.

<sup>2</sup> The additional classification of OA articles within Dimensions includes Green and Bronze, utilising the unpaywall classification of articles. See <https://dimensions.freshdesk.com/support/solutions/articles/23000018863-where-does-the-definition-of-open-access-come-from-in-dimensions-what-does-it-include->



Among the various geographic regions, contribution to OA published articles was highest in the UK/ Western Europe, while it was lowest in Australasia and South/Central/Latin America.



# What is driving OA publication in physics?

## Principles and benefits of OA

**26%**

respondents agree with the principles behind OA.

**25%**

want to reach a wider readership.

**24%**

thought an OA journal was the best fit for the work.

When asked whether researchers would prefer OA or have unrestricted choice of where to publish, more than

**53%**

said they would prefer their work to be published OA.

A significantly higher number of respondents indicated their agreement with the principles of OA in the UK/Western Europe, consistent with the higher volume of OA publications and funder mandates for OA from this region. In general, researchers recognise the importance of widening access to readers around the world.

“ There are some institutions, students and poor countries...they don't have good access. If we publish in OA journals then our research will be available to them all the time 24-7, they will get some knowledge from this sharing.

**PhD candidate**, 1–5 years' publishing experience, Korea

This is consistent with research findings that 25% of researchers recognise the importance of widening access to readers around the world.

“ The outreach is very quick, very, very quick. And of course, because you have Open Access, definitely you are likely to get more citations with it.

**PhD candidate**, 1–5 years' publishing experience, India

Nearly a quarter commented that an OA journal was the best fit for their work (24%).

## Policies for OA funding

Policy requirements and the availability of funding are notable factors driving higher uptake in regions with policies in place for OA.

The majority of respondents believed they were not currently under any obligations to publish their work in OA formats.

**< 20%**

of respondents in any demographic reported that OA is mandated by their employer.

**< 30%**

in any demographic reported that they are subject to mandates from their research funder.

Requirements and encouragement for OA publication are highest in the UK/Western Europe and lowest in South/Central/Latin America:

**UK/Western Europe:**

**30%**

required to publish in OA.

**35%**

encouraged to publish in OA.

**South/Central/Latin America:**

**73%**

have no OA requirements.

With policies and centralised funding for OA most established across Western Europe, the normalisation of OA may now be occurring in this region, with one researcher commenting:

“ I see that particularly in European co-authors that there is more and more of a push towards Open Access. But for the most part, they don't even talk to me about it. They just do it.

**Professor**, 16+ years' experience, USA.

This complements feedback from an interviewee in France where funder requirements are already well-established:

“ It's clearly stated that to apply for this [funding] you have to commit yourself that everything published under this funding will be Open Access. That's new. This has come about in the last five years. It is very explicit.

**Senior researcher**, 16+ years' publishing experience, UK and Western Europe

One interviewee spotlighted funding as a means of incentivising OA uptake: she compared experiences as a researcher in Germany and the USA to her experience as a Professor in a State University in Brazil:

“ Here in Brazil right now, we have a lot of great universities. I mean big universities and we are seeing that research in Brazil is growing. I really hope...the rules change a little bit so that we have more incentive ... [When in Germany] ... I remember that at least part of the funding, the university would pay for us, it was something like 2000 Euros or something like that ...I was really hoping that it would be something that we could see more often here in Brazil, that we would have this financial support.

**Professor**, 1-5 years' experience, Brazil

### **Custodians of ECR decisions**

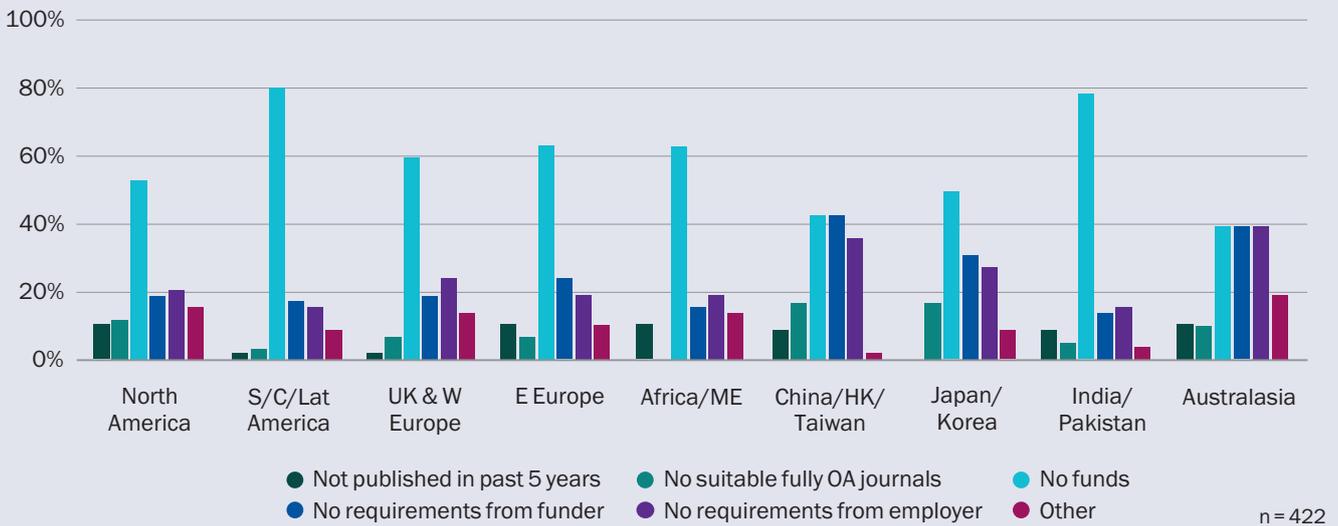
More senior respondents overall reported having requirements to publish OA (18.8% of those 16+ years into their career) than those earlier in their careers (15.9% for those 1-5 years into their career). It is likely that more experienced researchers have greater access to funding and therefore take on the associated requirements around the use of that funding. For that reason, professors and lab directors will continue to play an influential role in how far ECRs – the senior researchers of the future – are exposed to information and a culture of OA publishing.

# What are the barriers to publishing gold OA in physics?

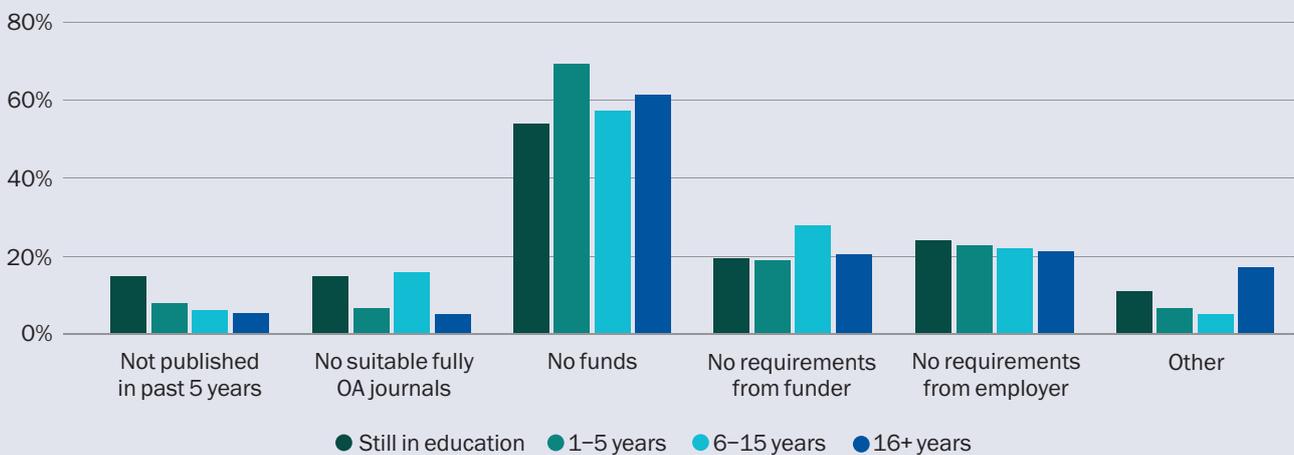
## Lack of funds

Around two-thirds of respondents have been prevented from publishing OA because they have not been able to access the necessary monies from funding agencies to cover the cost. The lack of funding is most keenly felt by researchers in South, Central and Latin America, as well as in India and Pakistan, where approximately 80% of respondents specified a lack of funds as the main reason for not publishing OA.

For what reason(s) have you not published your work OA?



For what reason(s) have you not published your work OA? (by career stage)



# 30%

of respondents say they have not been able to publish in a specific journal.

Of those facing challenges:

# 51%

were based in South/  
Central/Latin America.

# 47%

were based in Africa/ the  
Middle East.

# 36%

were based in India/  
Pakistan.

# 30%

had cost issues but were able to pay  
from a special fund (particularly in the  
UK/Western Europe, Australasia,  
and China/Hong Kong/Taiwan).

# 12%

were able to claim a waiver from the  
publisher (especially those in Latin  
America).

# 70%

of early career researchers (1–5 years) say that they have been prevented from  
publishing OA because they have not been able to access the necessary monies from  
funding agencies to cover the cost.

“ If we decide to publish open access, I have to fund it from my own pocket and the publication for one article would be something like two months of payment. So it is just a lot. I cannot afford it.

**Professor**, 1–5 years' experience, Brazil

### **Lack of incentives**

As noted earlier, the majority of respondents believed they were neither required nor encouraged to publish OA. Some interviewees stressed the need for a level playing field:

“ I think it requires funding bodies... to take the big step and if it's not all done together, then there are going to be winners and losers. And that will create an inequity for some time. I'm lucky that I'm in a relatively privileged position and a rich country and everything's easily accessible. And you know, there's lots of places in the world that aren't, and there's lots of clever people around and they deserve a chance as well.

**Department head**, 16+ years' of publishing experience, Australia

Those at early stages of their careers raised concerns about the perception of OA as poor quality, emphasising the need for further education and support for these more junior researchers:

“ If you are publishing too much open access, people will say maybe you are getting some benefit by paying some money. So that's the general mood of researchers. If too much open access, then there will be concern.

**PhD candidate**, 1–5 years' experience, USA

### Green OA

64%

have uploaded work to a repository

n = 2,819

In contrast to the low uptake of gold OA, the use of repositories was high among respondents, especially for researchers in astrophysics, condensed matter, and particle/nuclear physics, which reflects known community norms related to the use of arXiv as an OA repository in these fields<sup>3</sup>. Interviewees acknowledged that although gold OA is becoming more common, the wide availability of preprints via arXiv gives adequate free access to a version of the research:

“ Five years ago I could still do nothing about open access and it would be in the repository anyway. But I could forget to check whether the journal itself offers open access or not, and now this would not happen anymore. It’s a forced decision because the funding that I’m using requires that our publications are open access. I’m not saying that I disapprove of it, but it just came along and now we have to live with it. Five years ago I was happy with the repositories.

**Senior researcher**, 16+ years’ publishing experience, UK & Western Europe

<sup>3</sup> A further Dimensions search shows that out of the 71k 2021 physical science articles classed as Green OA, approximately half (35K) were uploaded to arXiv.

## The implications of a fully OA journal policy

In Europe, OA funding policies over the past few years have largely been driven by a group of national research funding organizations that launched an initiative called cOAlition S in September 2018. cOAlition S is built around a set of OA principles called Plan S and Plan S funder policies began to take effect in January 2021. However, at the time of the survey in December 2021, very few respondents were aware of cOAlition S or Plan S:

**15%**

overall are aware of Plan S, with little variation across regions (slightly higher awareness at 18% in the UK/Western Europe), career stage, or research discipline.

n = 2849

When asked how they thought Plan S would affect them of, those who were aware of it:

**37%**

believed it would change the journals to which they submit their work.

**32%**

believed it would require them to publish their work only in fully OA journals.

**30%**

believed it would require them to begin depositing research outputs in repositories.

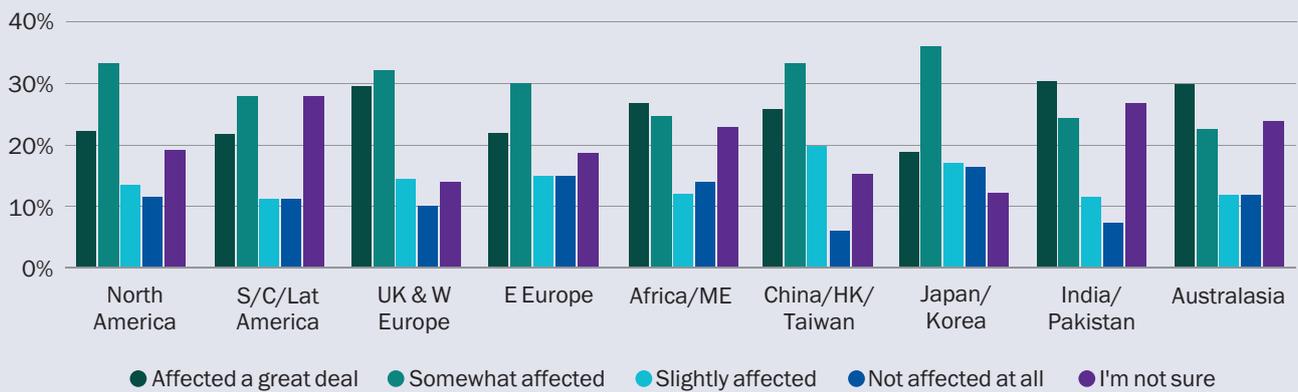
**24%**

believed it would not affect them.

n = 414

The majority of respondents felt that a policy that required publication in fully OA journals, whereby subscription and hybrid journals ceased to be compliant, would have an impact for them, with more than half believing that they would be somewhat/greatly affected.

If publication in subscription and hybrid journals ceased to be compliant with requirements from your employer / funder, how much do you feel your choice of publishing options would be affected?



Although some respondents saw value in enforcing a gold OA route, with benefits for existing fully OA journals, others saw a potential risk (notably for ECRs) in enforcing a fully OA journal mandate, in particular noting limitations in the availability of high quality, fully OA journals:

“ If there were high impact Open Access journals I think the young people would be enthusiastic about that, but if the Open Access journals were lower prestige and they felt they needed to get to the other ones, that would be some conflict there.

**Professor**, 16+ years’ publishing experience, USA

The risk of implementing policies at a regional level was also highlighted by some respondents, noting the challenge of an uneven playing field for collaboration and progression:

“ If there were certain parts of the world that were limited as to where they could publish, and others weren’t, then I could imagine that would create problems for those limited in where they could publish

**Department head**, 16+ years’ of publishing experience, Australia

## Taking next steps as a physics community

As society publishers, we want to be sure that governmental or funder mandates related to OA do not create a divide between those who can pay to publish their work OA and those who cannot. We believe that all authors should have the opportunity to publish their work, and the work published should represent the diversity of the global science community. Our report shows a range of needs across geographies and career stages; we have to work together to deliver OA publication options that work for the scientific community as a whole. All those involved in scientific communications need to ensure that researchers are not deterred from publishing their work, whether it be in a hybrid or OA journal.

### **ECRs must continue to be encouraged and supported**

ECRs are the future of science and the harbingers of change when it comes to scholarly communications. This study reveals that ECRs believe OA is more important than having the ability to choose where to publish, and they want to be able to reap the benefits of unrestricted access to research. But supporters of OA or not, article publishing charges (APCs) are a concern for ECRs due to lack of access to funds, or lack of awareness of the existence of funding sources.

Incentive structures must be tackled if ECRs are to benefit fully from OA publishing, and this must be done thoughtfully, especially considering career progression, to enable a fair global playing field for all researchers.

ECRs also need continued support and education on the availability of options and funding, both directly and via their custodians, be that professors or research offices.

Collaboration amongst all key stakeholders and a shared commitment to supporting high-quality publishing are key to overcoming barriers and developing policies, funding mechanisms and publishing options that ensure ECRs are fully supported in the future.

### **Lower-middle-income countries (LMICs) require equitable access to publication routes**

The lack of funding is most keenly felt by researchers in LMICs and is their main reason for not publishing OA. Researchers should never be deterred from choosing OA options in their journal of choice. As publishers of hybrid and OA journals, all of the physics societies involved in this study endeavour to support researchers from the least well-funded countries through APC waivers and discounts. However, although waivers provide partial support, they cannot alone address the wider issues related to the level and availability of funds required to support a sustainable, high-quality global OA publishing system. Our common ambition is that all OA models should provide financial support for author choice while also sustaining the quality of peer review and publication upon which excellent physics research relies.

### **Limiting publication routes will not meet the needs of the global physics community**

By surveying our Society members and authors, our collective research findings demonstrate the need for diverse systems, business models and policies that support publishing for all physical scientists regardless of their access to funding and support mechanisms. In particular, our report highlights the desirability of highly selective journals that offer high impact and recognition. Limiting some researchers via regional or funder-specific policies can only create an unequal system and hinder global collaboration in physics and the advancement of science.

### **Funders can drive change in the system but must support this with financial support and infrastructure**

In regions with established policies and funding for OA, we can see community norms for OA developing. Researchers based in other regions would, from our findings, welcome the introduction of financial support to publish their work in OA journals.

To make OA an easy option for researchers, funders need not only to provide access to funds, but also to increase researcher engagement. There remain pockets of doubt about the requirement for OA, and in many cases the burden is still on the individual to understand what is expected of them.

For OA to have the biggest impact in driving true scientific progress, its complexities and challenges across the globe must be fully understood and addressed through conversations and policies developed with funders, institutions, publishers, and the researchers themselves. A collaborative approach will ensure that the needs of all stakeholders are reflected, and that policies can be seamlessly adopted by researchers and by those supporting them to bring their work from conception to publication.



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