

# Exploring the Hidden Impacts of Open Access Financing Mechanisms

## AAAS SURVEY ON SCHOLARLY PUBLICATION EXPERIENCES & PERSPECTIVES

### EXECUTIVE SUMMARY

Broad access to rigorous, peer-reviewed scientific information is critical to scientific innovation and US global competitiveness. Over the past two decades, US policy has focused heavily on increasing access to published research, with tremendous benefits for science and society. The White House Office of Science and Technology Policy (OSTP) recently shared [guidance](#) aimed at making scientific publications supported by federal funding publicly available without an embargo by the end of 2025.

While open access has tremendous benefits, the primary mechanism that has evolved to enable OA for publications – the article processing charge (APC) – has created concerning unintended consequences. APCs, which are fees paid to publish open access, have engendered a pay-to-play environment that is contributing to growing inequities in who can publish and where. In a recent survey, the American Association for the Advancement of Science (AAAS) sought insight into researchers' and institutions' experiences with scientific publishing. We received complete responses from 422 researchers across the country and learned that:

- *Most Researchers Do Not Currently Budget for Publishing Costs & Many Have Not Yet Paid APCs:* Nearly two-thirds of researchers (n=264, 62.9%) reported that they did not budget for publishing costs. Slightly over one-third had never paid an APC.
- *Most Researchers Find It Difficult to Obtain Funds for APCs:* Of the researchers who had paid APCs (n=170) most reported it being very difficult (n=33, 19.4%) or difficult (n=56, 32.9%) to obtain funds to pay APC's. Researchers at institutions ranging from 3,000 to 9,999 students were three times as likely to find it difficult to very difficult as researchers at institutions larger than 10,000 students.

- *Most Researchers Are Using Grant Funds to Pay APCs:* Among the researchers who had paid APCs (n=173), most used grant funding to cover costs (n=120, 69.4%). Women were nearly three times as likely as men to have paid APCs using grant funds. Of 89 institutions represented by librarians and administrators who responded to the survey, only about one-third (n=32, 36.0%) had funds to support APC payments by students and/or faculty.
- *APCs Create Significant Tradeoffs for Researchers:* Over three-quarters of researchers (n=115, 77.7%) reported foregoing purchases of materials, equipment, or tools to pay APCs, and nearly three-fifths (n=86, 58.1%) reported not attending workshops or conferences relevant to their work. Compared with men, women were more than 2.5 times as likely not to attend workshops and conferences so that they could pay APCs.

These effects are not equal across institutions and researchers. Even within this sample, there were statistically significant differences in the ability to obtain funds and tradeoffs made – tradeoffs that can have notable effects on the ability of individuals to further their research and their careers.

### Recommendations

Ensuring that OA policies across federal research agencies do not embed adverse consequences of APCs and related financing models in our nation's scientific enterprise is paramount to the integrity of and trust in the enterprise. AAAS recommends study, evidence development, and response to:

- Understand the direct and indirect costs associated with OA policies and increased APCs.
- Ensure that federal policies solve access barriers, not create them.
- Provide clarity and consistency in OA policy terminology.
- Ensure alignment between OA policies and federal data policies.

# SURVEY REPORT:

## Exploring the Hidden Impacts of Open Access Financing Mechanisms

AAAS SURVEY ON SCHOLARLY PUBLICATION EXPERIENCES & PERSPECTIVES • FALL 2022

### INTRODUCTION

Broad access to rigorous, peer-reviewed scientific information helps to ensure scientific integrity and is critical to scientific innovation and US global competitiveness. Public access policies have been a key driver in increasing access to published research. Recently, the White House Office of Science and Technology Policy (OSTP) released [guidance](#) aimed at making scientific publications supported by federal funding, along with accompanying data, publicly available without an embargo by the end of 2025.

Equitable access to publications and publishing opportunities is vital to ensuring that scholarly publications are representative of the diversity of scientists conducting research, as well as the range of scientific disciplines. While open access has significant benefits, the primary mechanism that has evolved to enable OA for publications – the article processing charge (APC) – has created concerning unintended consequences. Increasingly, those who can find money in their research budgets to pay APCs have a distinct advantage over those without such funding, and with the adoption of increasing numbers of OA publication mandates by private and nonprofit research funders we face a growing risk that the ability to pay APCs – rather than the merits of the research – will determine what and who gets published.

The American Association for the Advancement of Science (AAAS) has been studying challenges with balancing the two goals of OA publishing—access to reading and access to publishing opportunities. Our study has included literature research, meetings with stakeholders across the scientific community, a “Listening Session on Inclusion and Scientific Integrity in an Evolving Open Access Financing Environment,” and – most recently – a survey of scientists, librarians, and administrators to better understand how approaches to financing OA are affecting the scientific enterprise.

## SURVEY OBJECTIVES & METHODS

The AAAS Survey on Scholarly Publication Experiences & Perspectives sought broader insight into researchers' experiences with scientific publishing and attitudes about publishing; information on university and college policies related to open content and steps universities and colleges may be taking to make their researchers' publications freely available; and information on steps that universities may or may not be taking to evaluate costs associated with various approaches to making scientific publications freely available. The survey's target audiences were:

1. Scientists who conduct and publish research or did so for a significant portion of their careers, in academic settings or at organizations whose primary purpose is research
2. Librarians in academic settings and libraries for organizations whose primary purpose is research
3. Administrators who oversee budgets that may be affected by publication costs, such as provosts and vice presidents for research

The survey was developed following a scoping review of the literature and discussions with key stakeholders. Prior to being launched, it was tested by members of the survey team, individuals at associations for the survey's target audiences, and individuals who represent the target audiences for the survey. A request for exemption from IRB review was submitted to WCG IRB, which granted the exemption. The survey was fielded using the Alchemer platform and open from the beginning of March through September 16th, 2022. It was distributed via outreach to AAAS membership; emails to AAAS partners and professional associations of scientists, administrators, and librarians requesting that they share the survey with their membership and institutions; and the *Science Careers* platform. Survey data were cleaned by the research team, which confirmed participants' eligibility and removed duplicates. Alchemer and Stata/IC 16 were used to characterize the data. Logistic regressions were used to identify factors that predicted difficulty paying APCs, use of specific funding sources to pay APCs, and specific tradeoffs made when paying APCs.

## SURVEY RESPONSE

422 complete unique responses were received from researchers who met the eligibility criteria for participation in the survey. The characteristics of these researchers are presented on the next page. The survey sample was reasonably representative of US college and university faculty in terms of race and ethnicity and generally overrepresented women. Researchers were at a range of career stages with varying experience publishing articles as primary or corresponding authors.



422

COMPLETE UNIQUE  
RESPONSES

## KEY FINDINGS

# Characteristics of Researchers Represented in Survey (N=422)

	n	%
<b>GENDER</b>		
Female/woman	211	50.0%
Male/man	204	48.3%
Non-binary	4	1.0%
Self-identify	1	0.2%
Missing	2	4.7%
<b>RACE</b>		
Asian and/or Pacific Islander	40	9.5%
Black or African American	25	5.9%
Multiple races	22	5.2%
<b>White</b>	<b>314</b>	<b>74.4%</b>
Other or prefer not to answer	21	5.0%
<b>ETHNICITY</b>		
Hispanic, Latino, or Spanish origin	21	5.1%
<b>ACADEMIC DEGREE(S)</b>		
Associates degree	15	3.6%
Bachelor's degree	203	48.1%
Master's degree (MS, MBA, MPH, etc.)	168	39.8%
Medical doctor (MD or DO)	15	3.6%
<b>Doctoral degree (PhD, DrEd, DrPh, etc.)</b>	<b>349</b>	<b>82.7%</b>
Other professional degree (JD, etc.)	14	3.3%
Other	10	2.4%
<b>FIELD</b>		
Computer and information sciences	11	2.6%
Engineering	28	6.6%
Geosciences	12	2.8%
Health sciences	62	14.7%
Humanities	4	1.0%
<b>Life sciences</b>	<b>142</b>	<b>33.7%</b>
Mathematics and statistics	13	3.1%
Physical sciences	41	9.7%
Social sciences	45	10.7%
Interdisciplinary	28	6.6%
Multidisciplinary	13	3.1%
Other	23	5.5%

	n	%
<b>ROLE WITHIN INSTITUTION</b>		
Adjunct faculty or lecturer	5	1.2%
Assistant professor	44	10.4%
Associate professor	58	13.7%
<b>Full professor</b>	<b>151</b>	<b>35.8%</b>
Graduate student	54	12.8%
Postdoc	46	10.9%
Staff scientist	37	8.8%
Other	27	6.4%
<b>LENGTH OF TIME CONDUCTING RESEARCH</b>		
<b>1-10 years</b>	<b>139</b>	<b>33.0%</b>
11-20 years	91	21.6%
21-30 years	76	18.1%
>30 years	115	27.3%
<b>INSTITUTION SIZE</b>		
<3,000 students	43	10.3%
3,000-9,999 students	72	17.2%
<b>10,000 or more students</b>	<b>278</b>	<b>65.9%</b>
NA	26	6.2%

### Our survey sample is similar to US faculty at degree-granting postsecondary institutions based on race and ethnicity

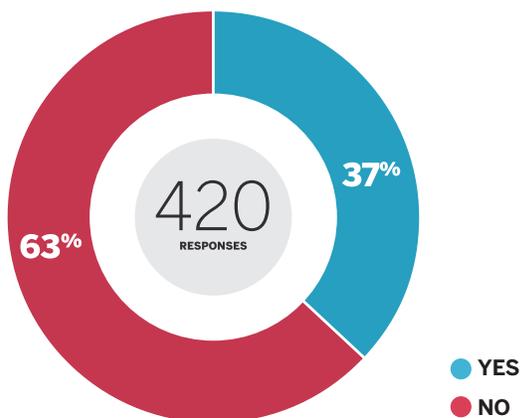
Race and Ethnicity of US Faculty	Male	Female	Total
Asian/Pacific Islander	7%	5%	12%
Black	4%	3%	7%
White	39%	35%	74%
American Indian/ Alaska Native & 2+ Races	<1%	<1%	<1%
Hispanic	3%	3%	6%

Source: National Center for Education Statistics  
<https://nces.ed.gov/fastfacts/display.asp?id=61>

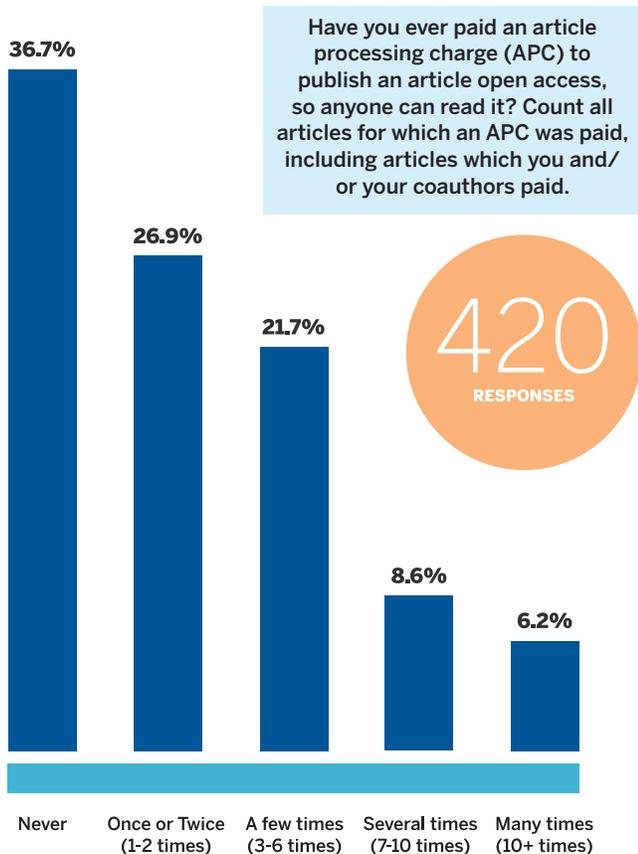
## KEY FINDINGS

### Most Researchers Do Not Currently Budget for Publishing Costs & Many Have Not Yet Paid APCs

Do you budget for costs associated with publishing your research?



Nearly two-thirds of researchers (n=264, 62.9%) reported that they did not budget for publishing costs, and slightly over one-third had never paid an APC.

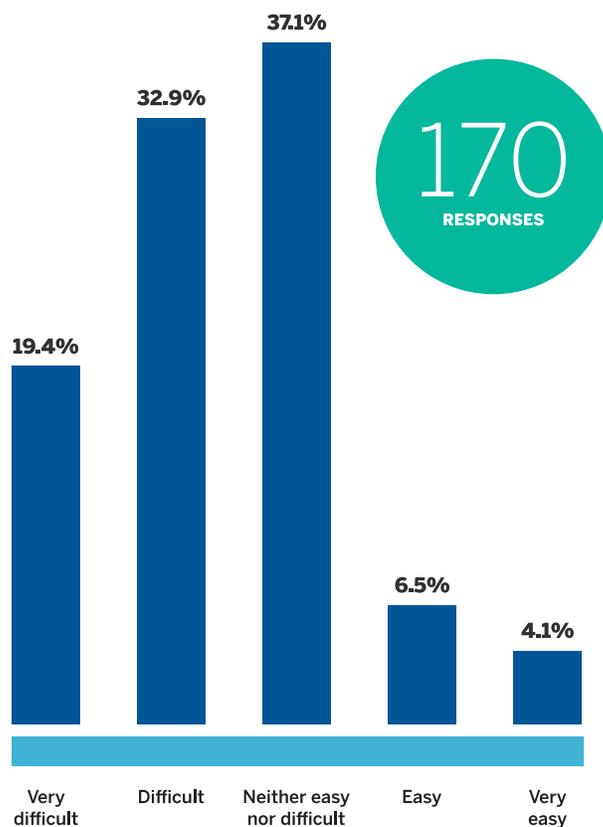


### Most Researchers Find It Difficult to Obtain Funds for APCs

Of the researchers who had paid APCs and answered a question about their ability to obtain APC funds (n=170), a minority reported that it was easy to obtain funds for APCs: only eleven individuals (6.5%) reported obtaining funds as being easy and only seven (4.1%) reported that it was very easy. Most reported it being very difficult (n=33, 19.4%) or difficult (n=56, 32.9%).

Further, the ability to obtain funding varied by institution size: adjusting for gender, race, and length of time conducting research, researchers at institutions ranging from 3,000 to 9,999 students were three times as likely to find it difficult to very difficult to obtain funds for APCs as researchers at institutions larger than 10,000 students (odds ratio 3.1, p<0.05, comparing "Very Difficult" and "Difficult" with "Neither Easy nor Difficult," "Easy," and "Very Easy").

In general, how easy or difficult has it been to obtain funds to pay APCs?

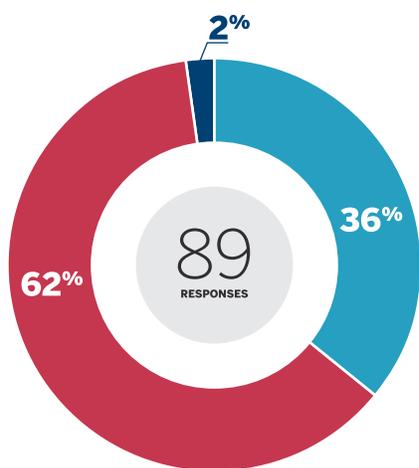


## KEY FINDINGS

### Funding Sources for APCs: Most Researchers Are Using Grant Funds

Based on data from the librarian and administrator surveys, most institutions do not have funds available to support payment of APCs. Of 89 institutions represented across these two categories of respondents, only about one-third (n=32, 36.0%) reported having funds available to support payment of APCs by students and/or faculty.<sup>1</sup>

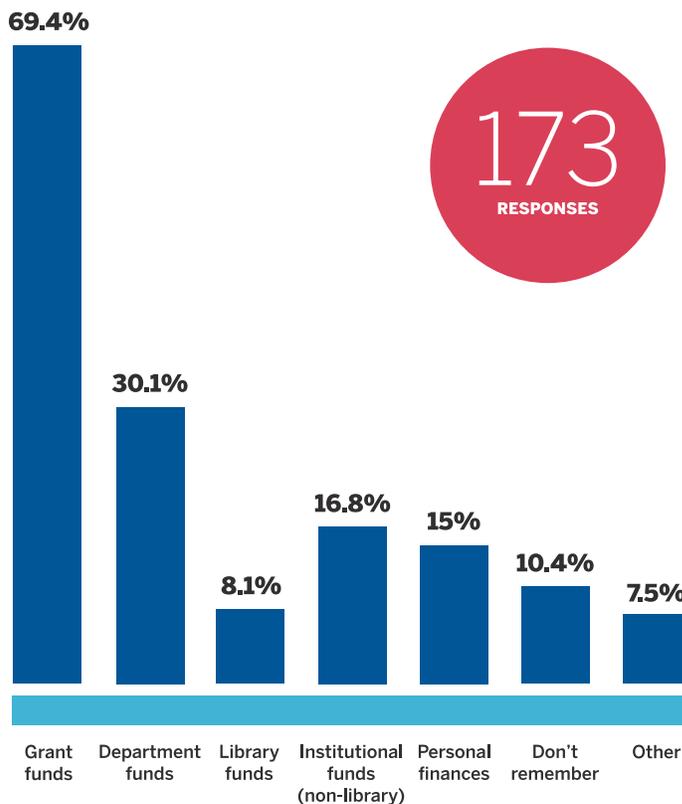
Institutional Funds Available for APC Payments



- YES
- NO
- DON'T KNOW

Among the researchers who had paid APCs and answered a question about funds used to pay (n=173), the most common source of APCs funds was grant funding (n=120, 69.4%), followed by department funds (n=52, 30.1%) and institutional funds (n=29, 16.8%). Furthermore, women were nearly three times as likely as men to have paid APCs using grant funds (odds ratio 2.7, p<0.05), adjusting for race, length of time conducting research, and institution size.

What types of funds have you used to pay APCs?

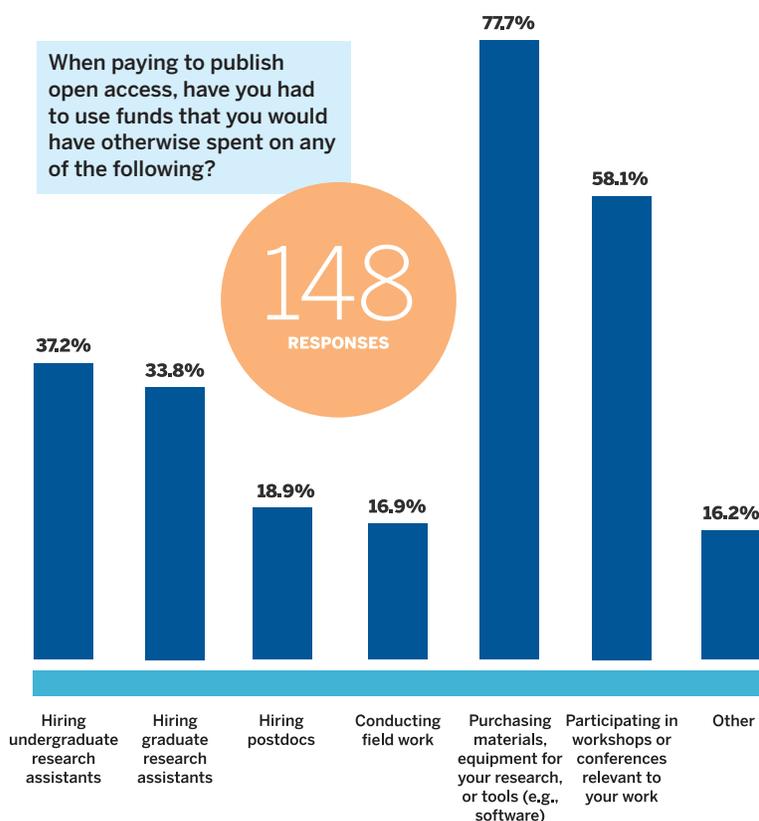


### APCs Create Significant Tradeoffs for Researchers

Researchers who had paid APCs reported a wide variety of tradeoffs created by publishing. When asked “When paying to publish open access, have you had to use funds that you would have otherwise spent on any of the following?”, over three-quarters of researchers (n=115, 77.7%) reported foregoing purchases of materials, equipment, or tools. Nearly three-fifths (n=86, 58.1%) reported not attending workshops or conferences relevant to their work. Compared with men, women were more than 2.5 times as likely not to attend workshops and conferences so that they could pay APCs, adjusting for race, length of time conducting research, and institution size (odds ratio 2.6, p<0.05).

<sup>1</sup>Data from these sections of the survey will be presented in detail in a subsequent publication. This information is presented here because of its salience and relevance to findings from the researcher section of the survey.

## KEY FINDINGS



## CONCLUSIONS

The results of this survey suggest that most researchers do not currently budget for costs associated with publishing their research and that many have not paid APCs previously. Of those who have paid APCs, many have found obtaining funding difficult. Researchers who have paid APCs have made significant tradeoffs between investment that further their research and careers, such as equipment purchases, event participation, and hiring. These effects are not equal across institutions and researchers. Even with the relatively small sample of researchers who had paid APCs, there were statistically significant differences in the ability to obtain funds and the tradeoffs that were created – tradeoffs that can have notable effects on the ability of individuals to further their research and their careers. Were this survey completed by a larger sample, we expect that more inequities would be revealed.

Ensuring that OA policies across federal research agencies do not embed unintended, adverse consequences of APCs and related financing models

in our nation's scientific enterprise is paramount to the future integrity of and trust in the enterprise. To support this aim, AAAS recommends study, evidence development, and response to:

**Understand the direct and indirect costs associated with OA policies and increased APCs.** We recommend that the federal government further study and report on the direct and indirect costs associated with increased article processing charges as a result of expanded OA policies. This information would help ensure not only that federal research dollars are being spent as intended on research but also that the costs of publishing are not creating arbitrary barriers to entry for the next generation of scientists.

**Ensure that federal policies solve access barriers, not create them.** Specific reporting should focus on the impact OA policies have on the cost of publishing and the ultimate availability of publishing opportunities for researchers at traditionally underrepresented institutions and in less-well-resourced disciplines. To this end, AAAS encourages further examination of the effects of publication access policies on research grant budgets as well as the effects on minority-serving institutions, historically black colleges and universities, EPSCoR-eligible institutions, and IDeA-eligible institutions.

**Provide clarity and consistency in policy terminology.** To ensure that there is no confusion or further unintended consequences of a new comprehensive federal OA policy proposal, we suggest clarifying the definition of an “author accepted manuscript.” The scientific community has a widely accepted definition of this term and using it in statute will ensure clarity and consistency across federal agencies. This will enable exploration of alternative OA models, including green OA.

**Ensure alignment between OA policies and federal data policies.** Federal data-access and data-management policies help leverage data assets while protecting security and privacy. New directives should ensure consistency between OA policies and federal data-access and data-management policies.