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Researchers' Views on Preprints and Open Access Publishing: Results From a Free-Answer Survey of Japanese Molecular Biologists

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ABSTRACT

A survey conducted in 2022 amongst members of the Molecular Biology Society of Japan ($n=633$) about preprints and open access journals included qualitative data from free-response answers ($n=161$). Analysis of the free-form responses suggests that researchers believe that peer review of papers is the foundation for ensuring the credibility of research content. The trust-building mechanism achieved through peer review shapes the research community. For this reason, researchers are extremely cautious about preprints that have not undergone peer review within their own fields. This foundation has fostered a sense of responsibility within the community, and this sense of responsibility, which is being fulfilled by ensuring the quality of research, is a mixture of both a sense of responsibility towards the community itself and a sense of responsibility towards the outside world, namely the relationship between researchers and society. Researchers also appear to view the rise in Article Processing Charges (APCs) as a problem for the entire community, rather than simply an issue for individual researchers. In the field of molecular biology, where collaborative research between universities and companies is common, differences in normative awareness based on position are reflected in the various attitudes towards preprints and open access.

1 | Introduction

'Open Science' has been recognised as an important component of science and technology policy beyond the research community (G7 2023). Although Open Science has many facets and is difficult to define, Vicente-Saez and Martinez-Fuentes (2018) describe it as 'transparent and accessible knowledge that is shared and developed through collaborative networks.' One of its key components is 'Open Access,' which enables not only experts but also non-specialists to read research papers. By making research findings promptly available, Open Access facilitates the sharing of knowledge within research communities and across society as a whole.

As components of Open Access, research papers published in journals can generally be divided into two categories: Gold Open Access, where articles are freely accessible to readers without a subscription fee, and Green Open Access, which allows authors to make their pre- or post-publication manuscripts freely available through institutional or dedicated repositories, or on their personal websites.

Green Open Access is often referred to as self-archiving, and one of its most notable forms involves posting preprints—manuscripts before peer review—on dedicated servers to rapidly share research results and promote discussion within the expert community. This practise expanded alongside the

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Key Points

- A qualitative analysis was conducted on the free-form responses to a survey on open access and preprints given to members of the Molecular Biology Society of Japan.
- Whilst acknowledging the usefulness of open access journals, concerns were raised about the soaring APCs.
- Many responses expressed concern about the publication of non peer-reviewed papers, and there was a presumption that the credibility of the society must be maintained.
- Maintaining the society's credibility means fulfilling responsibilities both to the research community and to society.

development of the internet. The launch of the preprint server arXiv in the early 1990s for high-energy physics marked the beginning of this trend, which gradually spread to various fields, particularly physics and mathematical sciences. Since 2010, preprint servers for a wide range of disciplines have been established, and more than 50 are currently in operation (Malički et al. 2020).

In the life sciences, the need to immediately share research findings—especially during the COVID-19 pandemic—led to an explosive increase in preprint submissions and usage. At the same time, however, concerns have emerged about the social impact of preprints, including the spread of misinformation (Ide et al. 2021).

Unlike preprints, peer-reviewed papers can typically be read only by those who have paid for a subscription to the journal in which they are published. Gold Open Access allows anyone to read such papers without paying subscription fees, as the publication costs are covered by the authors or their institutions.

In recent years, various forms of open access publishing have emerged depending on how the Article Processing Charges (APCs) are managed—such as Gold, Hybrid, Bronze, and Diamond OA models. However, Suber (2012) classifies all of these collectively as Gold Open Access. Some journals allow authors to decide on a paper-by-paper basis whether to make their work open access, whilst others now publish exclusively open access articles.

The number of papers published under open access continues to grow worldwide (Piwowar et al. 2018). By 2021, approximately 50% of papers indexed in the Web of Science Core Collection were open access (Ide and Hayashi 2022). Whilst open access improves accessibility to academic literature, researchers are often required to pay substantial APCs—averaging around USD 2000 for open access journals and USD 3000 for hybrid journals (Solomon and Björk 2016). A study of US medical schools suggested that APCs pose a financial burden on researchers (Halevi and Walsh 2021). This issue is believed to be similar amongst Japanese researchers, as indicated by reports from Japan's National Institute of Science and Technology Policy

(Nishikawa 2022), though further quantitative data are needed to substantiate this.

surveys on researchers' views of preprints and open access have been conducted in several countries. Researchers' attitudes towards open science, including open access, may vary depending on region, academic discipline, and age, and some prior studies have targeted specific groups to explore these differences (Jamali et al. 2020; Fu et al. 2024; Ng et al. 2024; Ni and Waltman 2024; Yi and Huh 2021; Nicholas et al. 2024). In addition to perspectives from researchers themselves, analyses from the viewpoints of funders and libraries have also been conducted (Green 2019).

In Japan, surveys such as that by Ikeuchi and Hayashi (2023) have investigated researchers' attitudes towards open access and preprints. Although the sample size was limited to around 1000 respondents, differences in awareness were observed across disciplines—for example, in physics, where preprints have been used for roughly 30 years, the adoption rate was notably high. The need for field-specific awareness studies is clear, and a statistical survey by Ide and Nakayama (2023) has examined the distribution of opinions amongst researchers in the field of molecular biology in Japan.

On the other hand, it is important to understand how researchers form their opinions about trends such as preprints and open access when choosing their survey responses. This can be achieved by analysing interviews and the open-ended sections of questionnaires. In contrast to quantitative methods, which analyse numerical data, qualitative research focuses on analysing linguistic data (Levitt et al. 2018). By qualitatively analysing the free-response sections of questionnaires, it is possible to reveal aspects that are difficult to capture through numerical data alone.

In this study, to clarify the issues and concerns researchers hold, the open-ended responses from the survey on preprints and open access publications (Ide and Nakayama 2023) were analysed using qualitative methods.

2 | Materials and Methods

The survey used for secondary analysis in this study was conducted from September 14 to October 5, 2022 (Ide and Nakayama 2023). The participants were members of the Molecular Biology Society of Japan (MBSJ) ($n=11,792$ as of November 2022). An email inviting responses to the survey was distributed through the MBSJ mailing list, and the information was also posted on the society's official Facebook page. The survey was conducted with the respondents' consent. It consisted of 22 items addressing participants' background, awareness, and perceptions regarding open access and preprints, as well as related open-ended response sections.

During the survey period, 633 individuals responded (445 men, 186 women, and 2 others). Amongst them, 615 (97.2%) were affiliated with universities or research institutions, and 500 (79.0%) were faculty members. The survey results were published by Ide and Nakayama (2023), and the free-text data available as

Supporting Information ($n=161$) were used for analysis in this study.

Various qualitative methods exist for analysing linguistic or textual data. In this paper, opinions were categorised and analysed using the KJ method (Kawakita 1967, 1970; Yamaura 2012), a qualitative synthesis technique.

The KJ method, developed in Japan, is a qualitative synthesis technique, and most explanations of the method are available in Japanese. However, English-language discussions include Scupin (1997), and methodological explanations applied to KJ-based analyses can be found in Fukuda et al. (2015) and Tagaki (2017). The basic analytical process is outlined below.

The KJ method consists of three main processes: code creation, grouping, and chart construction (Kawakita 1967, 1970; Yamaura 2012).

First, the sentences from open-ended responses are broken down into the smallest possible units whilst preserving the respondent's intended meaning. In analyzing free-text responses, it is common for respondents to include multiple ideas within a single answer; therefore, it is necessary to decompose these into individual units for analysis. Each unit is identified as a code. In the KJ method, each code is typically written on a card about the size of a business card.

Next, the set of codes is grouped by collecting those that share similar meanings or themes. The cards are spread out on a large surface, and after the initial grouping, a short summary is written to describe the essence of all codes belonging to each group. This summary then serves as a label representing the group in the next stage.

This grouping process constitutes one step. The newly created labels, along with any remaining ungrouped codes, are then treated as a new set of codes, and the same process is repeated. Grouping continues iteratively until approximately six labels have been formed. These labels are then arranged two-dimensionally on a chart to identify the relationships between them in the final grouping stage.

This method was developed in Japan, and a similar approach developed around the same time is the Grounded Theory Approach (GTA) (Glaser and Strauss 1998). Both are bottom-up methodologies that involve coding, grouping, and building relationships amongst groups. However, whilst GTA is oriented towards theory construction through conceptualization, the KJ method is particularly effective for model building and describing the current situation (Tagaki 2017; Nochi 2013).

Another distinctive feature of the KJ method is the use of business card-sized slips of paper for analysis. This originates from the fact that the KJ method was originally developed in the field of cultural anthropology as a tool for generating and organising ideas during qualitative exploration.

A partially consensus-based approach was adopted in this study (Hill et al. 1997; Fujioka 2013). Specifically, the first author conducted the initial coding, grouping, and chart creation,

after which the second and third authors reviewed and revised each stage.

The free-text data analysed were published in both Japanese and English. However, since the original responses were written in Japanese, the analysis was conducted using the Japanese text, and the results were subsequently translated into English.

3 | Results and Discussion

3.1 | Classification by KJ Method

The survey results were ultimately summarised into six statements (Table 1: table1_rev.xlsx). Respondents generally assumed that peer review guarantees reliability (Statement 1). Based on this premise, their opinions could be divided into two categories: those concerning preprints, which are not peer-reviewed (Statements 2–5), and those concerning open access papers, which have undergone peer review (Statement 6). Some respondents recognised that whilst preprints have both advantages and disadvantages, the benefits and challenges are not yet sufficiently shared within the research community (Statement 2). A particular concern was that publishing low-quality preprints could undermine trust in the research community and in science itself (Statement 3). Although various pros and cons of preprints were noted, respondents acknowledged that preprints are already widely used in practise, and therefore the community should establish appropriate guidelines and frameworks (Statement 4). Focusing on the usefulness of preprints, some respondents also argued that trust in peer review is not absolute, and that the decision to use preprints should be left to individual judgement (Statement 5). Whilst concerns about preprints centred on their content, those about peer-reviewed open access papers were focused on the rising cost of Article Processing Charges (APCs). Respondents acknowledged the usefulness of open access but expressed the view that the growing financial burden of APCs cannot be handled individually and requires a coordinated response from the research community (Statement 6). Although the need for a collective or 'industry-wide' response was a common theme in both discussions, the nature of the issues differed: for preprints, the response required normative measures such as establishing guidelines and improving awareness, whereas for open access, the response pertained to concrete financial issues such as research funding.

3.2 | Overall Comparison With the Questionnaire Results

The survey conducted in 2022 amongst members of the Molecular Biology Society of Japan (MBSJ) examined researchers' awareness and attitudes towards open access and preprints. After the multiple-choice questions, an open-ended section was provided, where respondents could freely describe points of personal concern.

More than 90% of respondents expressed a desire to publish their academic papers as open access. However, only about 77% had actually published a paper. Amongst respondents familiar with the term *preprint*, 183 individuals (33.9%) had submitted

TABLE 1 | The results of summarising the opinions written in the free-response sections using the KJ method.

1	The peer review process is a long-established system that enhances credibility. Peer-reviewed journals should be distinguished from non-peer-reviewed ones.
2	Preprints are not peer-reviewed, and as a result, their use is expanding without sufficient awareness amongst researchers of the benefits and problems that come with using preprints, such as content evaluation, social dissemination, and even risk assessment. First, researchers need to share an understanding of preprints and then discuss and organise measures to address them.
3	Some researchers might publish low-quality work as preprints, posing the risk of undermining credibility in the research community and science itself.
4	Although preprints face various issues, such as handling quality and content problems due to lack of peer review, and managing duplicate submissions and priority claims, their use is increasing as times change. However, some individuals are hesitant to adopt them without established rules, highlighting a demand for the development of community guidelines.
5	Preprints are not peer-reviewed; however, some peer-reviewed papers are also low-quality. Despite this, preprints contribute to the community by offering rapid dissemination and information sharing. When used appropriately, they can be highly beneficial. Thus, those who understand their limitations still utilise them, and they are likely to remain widely used in the future, though usage will depend on individual discretion.
6	Whilst open access has the advantage of being free and widely read, the publication fees are very high. It is necessary to move beyond individual responses and consider collective actions, including problem sharing, as a community.

one. About half of all respondents indicated that they would like to submit a preprint in the future, whereas 240 (44.4%) stated that they did not wish to do so. Overall, members of MBSJ held relatively cautious views towards preprints, and this cautious stance was reflected in the diversity of opinions recorded in the free-response section.

In the following section, the concerns identified from the free-text analysis using the KJ method are examined in comparison with these quantitative survey results. Additionally, this analysis is cross-referenced with the findings of Ikeuchi and Hayashi (2023), who conducted a cross-disciplinary survey in Japan on researchers' attitudes towards preprints and open access. Their study—including both quantitative data and open-ended responses (the response numbers cited here correspond to those in the original paper, not to the codes used in this manuscript)—serves as a useful point of comparison for understanding broader trends amongst Japanese researchers regarding preprints and open science.

3.3 | Comparison Between the Categorised Comment Groups and the Questionnaire Results

3.3.1 | Trust in the Peer Review System

As a premise for respondents' understanding of open access, preprints, and research responsibility, it is evident that they generally hold a fundamental trust in the peer review system (Statement 1). Whilst they do not unconditionally judge the validity of papers based solely on whether they have been peer-reviewed (Statement 6), they recognise its limitations whilst still viewing it as a reliable mechanism for establishing trust.

Amongst those who answered negatively to the question, 'Do you plan to submit a preprint in the future?', the most frequently chosen reasons in the multiple-choice section were 'I don't see

the necessity' and 'I would like to submit my paper first to a peer-reviewed journal' (both $N=61$). In addition, a significant number of respondents ($N=21$) selected 'Because it is not peer-reviewed.' These responses, taken together, indicate that many researchers place strong trust in the peer review system, which functions as a mechanism of mutual evaluation amongst experts.

This attitude suggests that, for these respondents, the peer review process remains the foundation of scientific credibility and an essential step before public dissemination of research results.

11: Even peer-reviewed papers can have issues with reproducibility, but peer review helps prevent some of these issues. (The rest is omitted.)

88: Since it is at the preprint stage, there is still a risk that the quality may be lacking. However, even peer-reviewed papers could have been reviewed leniently, and even top journals can publish data that lack reproducibility. Considering the emphasis on new concepts, it is important to actively publish preprints. If the concept is valid, it will be cited frequently and gain recognition.

Although peer review is not trusted unconditionally, reliability has been maintained through mutual checking within each academic field. Based on this premise, respondents discussed the potential issues of preprints and open access journals.

Trust in peer review and anxiety towards non-peer-reviewed literature can be understood as stemming from uncertainty surrounding the essential functions of the journal community (Fujigaki 2018; Fujigaki and Fujigaki 2018). According to Fujigaki, the usefulness of the journal community as a unit for producing academic knowledge lies in four main aspects:

1. Papers serve as the standard for academic evaluation;
2. Acceptance by a professional journal guarantees the validity of the work;
3. Writing papers is the foundation of training and educating junior researchers;
4. The acquisition of funding and status depends on the number and presence of peer-reviewed publications.

Since preprints have not undergone peer review, they cannot be said to ensure validity through the journal community, and thus may challenge the very significance of that community as a mechanism for scholarly production. Whether preprints should be treated as research achievements may therefore reflect considerations about the continued existence and legitimacy of the journal community. This perspective aligns, at least in part, with the advantages identified in the survey by Ikeuchi and Hayashi (2023)—namely, the benefits of rapid dissemination and community contribution through information sharing.

3.3.2 | Scope of Issues Recognised by Researchers

Amongst researchers who expressed concerns about the reliability of preprints that have not undergone peer review, their perceived scope of responsibility varies—some see it as confined within their research field or discipline, whilst others extend it to society at large, including the general public.

In the MBSJ member survey, one of the reasons given for not using preprints was the ‘risk of plagiarism’ ($N=55$). Similarly, in other studies, reasons for withholding preprints included concerns about evaluation, public dissemination, plagiarism risks, handling of quality issues, double submission, and priority verification—all of which were also cited by Ikeuchi and Hayashi (2023). Concerns such as evaluation and plagiarism risks relate primarily to internal responsibilities within the research community, whilst issues related to public dissemination concern how researchers perceive their external responsibilities towards society.

As Fujigaki (2018) and Douglas and Savulescu (2010) have pointed out, researchers’ responsibilities can be broadly divided into those towards the research community and those towards society. In this analysis, the concept of ‘trust’ that researchers fear losing also has multiple dimensions. The trust perceived to be lost when unreliable information is disseminated encompasses both trust from other disciplines and from the broader public. It can be interpreted that researchers aim to fulfil their social responsibility by maintaining trust within their own community.

The functions of academic societies have evolved over time. Based on a review of previous research, Delicado et al. (2014) identified five traditional roles of academic societies: (1) communication amongst peers, (2) promotion of research, (3) dissemination of scientific knowledge, (4) representation of professional interests, and (5) policy advice. They argue that the outward-facing roles—linking academia with society—have become increasingly important compared to inward-facing,

community-oriented functions. Ensuring the reliability of research content remains an internal function of the community, but the mechanism that sustains this trust also indirectly fulfils the outward-facing role of connecting academia with society.

Furthermore, the ways in which academic societies’ roles are changing may differ depending on disciplinary and regional contexts, a point emphasised in recent studies such as Late et al. (2024).

Researchers’ sense of responsibility is grounded in multiple principles that guide their conduct.

Merton identified four key elements of the ethos of modern science—universalism, communism, disinterestedness, and organised scepticism—and also pointed to originality as a separate but related value (Merton 1968). These four or five norms together are known by the acronym CUDOS (Ziman 1994).

In contrast, Ziman argued that when considering industrial or corporate researchers, one must recognise that their behaviour is guided by a different set of organisational principles: proprietary, local, authoritarian, commissioned, and expert work, collectively called PLACE (Ziman 1994). Whilst CUDOS describes the ethos to which individual academic scientists are expected to adhere, PLACE reflects the logic of career advancement and organisational goals.

Ziman contrasted academic science and post-academic science in terms of adherence to CUDOS, arguing that the coexistence of CUDOS and PLACE is nearly impossible (Ziman 1994). Similarly, Smart et al. (2019) noted that whilst CUDOS applies well to the traditional model of science as a profession, it cannot be easily applied to open science, which involves not only experts but also non-specialists; thus, the compatibility between open access and traditional CUDOS norms requires careful consideration.

On the other hand, Gibbons and colleagues have argued that science and society are co-evolving, and from their perspective (Nowotony et al. 2000), Ziman’s view of scientists as a closed community detached from society appears less robust. In contemporary life sciences, including molecular biology, research involves not only universities and public institutes but also private-sector researchers from pharmaceutical, reagent, and manufacturing companies. This creates a hybrid structure in which academic and post-academic science coexist. Consequently, the principles underlying researchers’ sense of responsibility can be seen as a mixture of both CUDOS and PLACE, each applicable in different contexts of scientific practise.

Peer review fosters reliability through organised scepticism, whilst the content being evaluated involves originality and universalism—principles associated with internal responsibility within the research community. Meanwhile, the benefits of knowledge sharing through open access stem from disinterestedness and communism.

However, with the diversification of publication formats, some researchers expressed uncertainty about how to evaluate research achievements. This has led to concerns that the pressure

to publish quickly may result in overly localised or fragmented research, and that established researchers might develop authoritarian tendencies. The assertion of priority embodies both originality and a proprietary aspect. In areas where social demand is strong—such as COVID-19-related research—commissioned tendencies become more prominent, increasing pressure for rapid public release of results.

From these multiple perspectives, the behaviour expected of researchers as experts responding to social needs can be understood as one form of external responsibility.

3.3.3 | Public Awareness of Research and the Role of Peer Review

The trust-building mechanism of peer review—based on mutual verification of research content within a field—is unique to the research community and not necessarily well understood by the general public. Similar points were raised in the open-ended responses of the survey.

58: (Omitted) We should avoid publicizing non-peer-reviewed information to the general public because it could lead to the dissemination of incorrect scientific information. (Remainder omitted)

The respondent whose answer was cited assumes that the peer review mechanism is a cultural practise internal to the research community and not something that is generally known or understood by the public. The distinction between peer-reviewed and non-peer-reviewed work is essentially a matter of internal evaluation amongst researchers, and whether members of the general public should be expected to understand and interpret published papers based on their peer-review status is a separate issue altogether.

95: I believe preprints are used by people who understand they are not peer-reviewed and who assess their scientific validity for themselves. While information sharing is very important, all online information, not just open access, needs to be carefully verified before use; otherwise, falsehoods will spread unchecked. Peer review is what helps prevent this.

All the quoted responses share the underlying assumption that the peer review mechanism is a cultural practise internal to the research community, and not something that is widely understood by the general public. The distinction between peer-reviewed and non-peer-reviewed publications is essentially an internal criterion used amongst researchers. Whether or not members of the general public should be expected to understand and evaluate academic publications based on their peer-review status is a different issue altogether.

Citizens' understanding of peer review reflects differences in how clearly society perceives scientific research, and can also be seen as a variation in individuals' levels of scientific literacy.

According to Shen (1975), scientific literacy can be divided into three types: Practical literacy, which involves having scientific and technical knowledge that can immediately improve one's quality of life; Civic literacy, which enables citizens to better understand science and science-related issues so that they and their representatives can apply common sense to them; and Cultural literacy, which is driven by a desire to know about science as one of humanity's major achievements. Knowledge of peer review falls under civic literacy. Miller (1998) further subdivided civic literacy into three components: (1) understanding enough basic scientific vocabulary to interpret viewpoints in newspapers and magazines; (2) understanding the process or nature of scientific inquiry; and (3) understanding, to some extent, how science and technology affect individuals and society. According to this definition, citizens' understanding of the peer-review process corresponds to an enhancement of civic literacy.

As the use of preprints continues to expand, it is not sufficient to simply call for greater public scientific literacy; rather, researchers themselves must communicate information responsibly. However, the publication of non-peer-reviewed material requires a deeper understanding than vocabulary alone—it requires comprehension of the research process and its societal implications, which demands a higher level of literacy. Disseminating unverified findings widely and taking responsibility for the potential impact of such dissemination can therefore be regarded as a direct form of social responsibility. Conversely, issues such as rising APCs for open access publishing, the maintenance of trust through peer review systems, and research misconduct—including fabrication, falsification, and plagiarism (FFP)—represent internal responsibilities within the research community. The failure to uphold these responsibilities could lead to the decline of the community itself, thereby resulting in an indirect failure to fulfil social responsibility.

3.3.4 | Publishing Papers in Open Access Journals

Whilst opinions on preprints were primarily focused on concerns about content reliability, opinions on open access journals were concentrated on the rising cost of Article Processing Charges (APCs). Because various open access models exist depending on who bears the publication costs (Suber 2012; Bosman et al. 2021), making a paper open access does not necessarily mean that the author personally pays for it. Some journals are funded by institutions, consortia, or grants, which can offset or eliminate APCs. However, the responses in this survey indicate that some researchers perceive APCs as a direct personal burden. This perception suggests a growing tension between the ideals of open access—promoting free access to scientific knowledge—and the financial realities faced by individual researchers. Such concerns reflect the broader issue of equity in academic publishing: researchers with limited funding may find it increasingly difficult to publish in open access venues, potentially exacerbating disparities between well-funded and less-resourced institutions or disciplines.

153: (Omitted) Regarding open access, while it is a good way to make my research widely known, especially as subscription fees for journals are rising,

something needs to be done about the increasing submission fees. It would be helpful if there were a subsidy system for open access, separate from regular research funds.

This respondent pointed out that in response to rising APCs, financial support in the form of subsidies is needed beyond what individual researchers can cope with.

80: The APCs for open access journals have skyrocketed, and with the impact of the weak yen, it can now cost between 500,000 to 1 million yen or more to publish a single paper. In the future, it may become necessary to consider where to submit papers due to financial reasons. If this situation continues, I fear that Japan's international scientific presence will rapidly decline. (Remainder omitted)

In the above response, the difficulty of maintaining research activities through high APC fees is revealed, but the author is aware that this is an issue concerning the survival of Japan's research community.

125: (Omitted) Open access (OA) will become increasingly important, but costs are rising sharply (especially in this era of yen depreciation), creating a disparity where researchers who cannot afford OA fees will not receive sufficient citations. I find it unacceptable to waste money on suspicious emerging OA journals. One solution could be for multiple academic societies to collaborate and establish high-quality OA journals that ensure reliability.

This response also reflects concerns about the high cost of APCs, but instead of placing responsibility on individual researchers, it calls for academic societies, particularly those that publish journals, to address the issue.

This point overlaps with one of the main reasons for *not* adopting open access identified in previous studies. Ikeuchi and Hayashi (2023) argued that the problem of rising APCs extends beyond individual responsibility and should be addressed at the level of academic disciplines or the broader research community.

There are also international differences in perceptions of gold open access. Kumari and Subaveerapandiyan (2025) reported that researchers in developed countries tend to favour gold OA because it enhances research visibility and citation potential. In contrast, researchers in developing regions expressed concerns about the financial burden of APCs and the lack of institutional financial support. Whilst diamond OA, which requires no APCs, is perceived as more equitable, concerns remain about its sustainability.

Although APCs are often discussed as a matter of individual research funding, maintaining the research community is essential for ensuring both internal and external accountability. Therefore, the issue cannot be treated as a purely personal one.

Similarly, Borrego (2023) reviewed the literature on Article Processing Charges (APCs) and identified two major concerns: first, that authors with insufficient funding may be unable to publish their research, and second, that this financial barrier may affect the overall quality of academic journals. As highlighted in Statement 80, if the research community becomes unsustainable, the continuity of research itself may be jeopardised. This, in turn, could threaten the survival of the journal community, undermining researchers' ability to fulfil their social responsibility through the public dissemination of their findings.

4 | Conclusions

By analysing the free-response sections of a survey on open access publishing and preprints conducted amongst members of the Molecular Biology Society of Japan, this study was able to extract and conceptualise Japanese molecular biologists' perceptions, awareness of challenges, and sense of responsibility. In contemporary molecular biology, researchers occupy diverse positions, and their sense of responsibility—as well as the ethical stances that underlie it—varies depending on their respective roles and contexts.

It is necessary to conduct comparative studies across academic fields to understand how researchers and research communities perceive their sense of social responsibility differently by discipline.

In the context of science communication, Nagashima et al. (2023) conducted interviews with science communicators from various fields. Their study found that medical science communicators tend to emphasise practical literacy—that is, the pragmatic and utilitarian aspects of science—over cultural literacy, which is motivated by intellectual curiosity. In contrast, communicators in astronomy primarily engage in activities grounded in cultural literacy, highlighting a disciplinary difference in how science is connected to society.

Preprints and open access initiatives, as mechanisms for the social sharing of knowledge, also represent key components of science communication. Although the present study focuses on a single academic community, investigating how different fields approach these responsibilities and forms of openness will be essential for deepening our understanding of the relationship between researchers and society.

In response to the G7 Science and Technology Ministers' Communiqué (May 2023), Japan has decided that, starting in fiscal year 2025, all academic papers resulting from publicly funded research must be made immediately open access. Since Japan has been slower than other countries to adopt open science practises, the implementation of open access measures will need to be further developed in some disciplines. Consequently, researchers across all fields in Japan must now actively engage with open access publishing. Ide (2024) emphasised that Japan's response to the G7 declaration must take into account the contextual diversity of research fields, their distinct needs, and the various models of openness researchers may wish to pursue.

Given the profound societal impact that the trend towards open science may have, it is essential to continue analysing researchers' perspectives on their own research practises as a way to inform our understanding of the evolving role of science within society.

Author Contributions

Harufumi Tamazawa and Kazuki Ide: conceptualization, methodology. **Harufumi Tamazawa, Kazuki Ide, and Kazuhisa Kamegai:** investigation, analysis, writing – original draft, writing – review and editing.

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Disclosure

All authors ensure that the article is not under consideration elsewhere and if it has been previously published the details and permissions if required. Statements relating to our ethics and integrity policies, which may include any of the following: (Why are these important? We need to uphold rigorous ethical standards for the research we consider for publication).

Ethics Statement

The authors have nothing to report.

Consent

The authors have nothing to report.

Conflicts of Interest

Kazuki Ide received honoraria from Mimir Inc. solely outside the submitted work. He is also a member of the Editorial Policy Advisory Group of the Directory of Open Access Journals (DOAJ) Corporation. Harufumi Tamazawa and Kazuhisa Kamegai have no conflicts of interest directly relevant to the content of this article.

Data Availability Statement

The data that support the findings of this study are openly available in Supporting Information of Ide and Nakayama (2023): <https://doi.org/10.1111/gtc.13015>.

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