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Good Authorship Practice

Guidance for research contributors

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The Authorship Integrity Toolkit

This guidance is part of a toolkit designed to help research contributors uphold the highest standards of authorship practice, developed through a cross-sector project commissioned by UKRI and led by UKRIO.

In addition to this Good Authorship Practice guidance, the toolkit includes the following:

- **Model Authorship Dispute Procedure**
- **Template Authorship Strategy Agreement**

See **here** for more information about this toolkit.

Introduction

Authorship is one of the most visible and valued aspects of research. It recognises intellectual contributions, signals expertise and can play a key role in shaping careers. Authorship can also be a very rewarding experience, providing an opportunity to collaborate and contribute to a broader body of knowledge.

When approached thoughtfully, the process of agreeing authorship can strengthen research relationships, clarify expectations and celebrate the diverse contributions that make research possible. However, there are times when decisions on authorship can be challenging in practice, particularly in situations involving ambiguity around authorship criteria, disciplinary differences, misaligned expectations, power imbalances or complex collaborations.

This guidance aims to offer practical advice to foster a positive culture of best practice in authorship. It clarifies commonly accepted standards, offers contextual examples and suggests practical strategies to help contributors to research and innovation from all disciplines navigate potential and actual challenges. While the primary focus is on authorship practices related to research articles published in scholarly journals, the underlying principles are equally applicable to a broad range of outputs, including articles disseminated via other methods (e.g. open access platforms), as well as software, datasets, creative works and visual productions.

It is recommended that this guidance be used in conjunction with UKRIO's *Template Authorship Strategy Agreement,* and as needed, its *Authorship Dispute Model Procedure*. Ideally, discussions and agreements about authorship should take place early within the research process and be revisited periodically, and decisions about authorship should be supported with accurate documentation to reduce the risk of misattribution and disputes over authorship.

Defining authorship

The Committee on Publication Ethics (COPE) Authorship Discussion Document [1] defines authorship as follows:

> "The term authorship can refer to the creator or originator of an idea (e.g., the author of the theory of relativity) or the individual or individuals who develop and bring to fruition the product that disseminates intellectual or creative works (e.g., the author of a poem or a scholarly article)."

Authorship promotes transparency in the research process by clearly indicating who was involved, the nature of their contributions, and their accountability for the published work.

Appropriate attribution of authorship of research outputs matters because:

- Authorship comes with responsibility for the rigour, trustworthiness, integrity ethics and reliability of the reported output.
- It brings transparency, enabling readers to know who has conducted the research.
- It provides credit to those who have substantially contributed to the reported research.

All authors are required to take collective responsibility for the output as a whole, not just their contribution. In practice, this means that co-authors should have confidence in the integrity of each other's contributions.

Authorship is regarded as a form of academic or professional credit and formal recognition for individuals who have made substantial (understood as substantive or instrumental) and/or specific contributions to a research output. Appropriate, responsible and fair credit for research contributions is an important moral obligation underpinned by research integrity and publication ethics. It is a core component of good research practice and impacts credibility, job prospects, career advancement, grant funding and research and innovation.

Who should be an author?

There are no universally accepted standards for attributing authorship in research. Nonetheless, reaching mutual agreement on authorship criteria in advance promotes fairness, accountability, transparency and appropriate recognition of credit.

Steps to underpin responsible authorship practices

Across all disciplines, four essential steps support responsible authorship practices:

1. Reach a mutual agreement at an early stage of the research on clear and equitable authorship criteria, considering any relevant publisher or disciplinary guidelines.
2. Mutually agree on authorship eligibility based on the agreed criteria and keep a regularly updated record of any changes to authorship that occur during the research process.
3. Be transparent about the specific contributions each author has made to the research output.
4. Formally acknowledge contributions from individuals who do not meet authorship criteria, thereby ensuring appropriate recognition for all.

You can use these four steps to facilitate informed discussions about contributions to your research.

Authorship criteria

Among various recognised models for determining authorship, the criteria developed by the International Committee of Medical Journal Editors (ICMJE) are widely used, particularly in biomedical and clinical research and have also informed authorship policies in other fields, including some areas of the arts, humanities and social sciences (AHSS).

The ICMJE recommends four criteria that should be met for authorship in medical journals [2]:

> 1. "Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
> 2. Drafting the work or reviewing it critically for important intellectual content; AND
> 3. Final approval of the version to be published; AND
> 4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved."

Other models of authorship criteria also exist. For example, McNutt *et al.* (2018) proposed an adapted version of the ICMJE guidelines to encourage wider adoption [3]:

> 1. "Each author is expected to have made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data; or the creation of new software used in the work; or have drafted the work or substantively revised it; AND
> 2. To have approved the submitted version (and any substantially modified version that involves the author's contribution to the study); AND
> 3. To have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature."

Research contributors will need to reach an agreement on what constitutes a substantial (substantive, or instrumental) contribution within their field of research. For example, in AHSS contexts, these contributions could be creative, interpretive or curatorial, rather than focused on data analysis.

Contributorship and Acknowledgements

Contributorship is a broader concept than authorship, offering a way to acknowledge everyone who played a meaningful role in creating or presenting a research output, not just those listed as authors. First proposed in the 1990s as an alternative to traditional authorship (similar to film credits, where individuals are listed against a description of their contribution), contributorship has not replaced authorship but remains a useful framework for acknowledging the full range of research contributions.

In practice, contributors can be recognised in two main places within a research output:

1. **Author list** – for those who meet authorship criteria.
2. **Acknowledgements section** – for those who contributed but don't meet the criteria for authorship. This section may also include funding sources.

Both authors and non-author contributors should have their roles clearly described. One example of a widely accepted, community-owned standardised system for recognising contributorship is the CRediT (Contributor Roles Taxonomy) system, which is supported by many journals and institutions. CRediT is designed for science, technology and mathematics (STM) disciplines, and may be more suitable for these disciplines than others.

CRediT identifies 14 specific types of research contributions

1. *Conceptualisation*
2. *Data curation*
3. *Formal analysis*
4. *Funding acquisition*
5. *Investigation*
6. *Methodology*
7. *Project administration*
8. *Resources*
9. *Software*
10. *Supervision*
11. *Validation*
12. *Visualisation*
13. *Writing – original draft*
14. *Writing – review & editing*

Using a standardised system to recognise contributions offers several benefits, most notably, increased visibility and transparency (learn more from the National Information Standards Organization, NISO). It also supports research information management, metascience and research assessment. Such systems can be used for both single and multiple authors. When multiple individuals share the same role, the level of contribution can be included, e.g. 'lead', 'equal', or 'supporting'. The CRediT system does not define what constitutes authorship, but helps acknowledge all contributions to a research output and can support decisions about who meets the agreed authorship criteria.

Research contributors in AHSS disciplines who are interested in exploring contributorship models can adapt or extend CRediT roles to better reflect practices specific to their discipline. NISO is planning future work in collaboration with the research community to explore how the CRediT taxonomy might be expanded. This could include introducing new roles tailored to AHSS research, such as historical analysis and production-creative, production-social, reflective analysis and relationship development and outreach.

Although these roles fall outside the current CRediT taxonomy, they illustrate how contributors from different disciplines can document individual contributions transparently. It is essential that research contributors reach a collective agreement on the approach to defining and assigning roles. These decisions should be documented and communicated, both within the publication and to the publisher, to ensure transparency and accountability in authorship practices

Practical advice on authorship criteria and contributorship

Interpreting "substantial contribution"

Authorship eligibility criteria typically require that individuals have made a substantial contribution to the work. The interpretation of these terms can vary across disciplines, organisations and publishers. Given this potential for ambiguity, we recommend considering whether a person's input was instrumental to the research or output, that is, whether the work would have been meaningfully different in the absence of their contribution. Researchers should discuss and agree at an early stage how they will interpret what constitutes a "substantial" contribution, as this lack of agreement or clarity on this point is often a cause of authorship disputes.

Avoiding the use of criteria to deny authorship

An important point highlighted by the ICMJE is that authorship criteria must not be used to exclude people on a technicality:

> "The criteria are not intended for use as a means to disqualify colleagues from authorship who otherwise meet authorship criteria by denying them the opportunity to meet criterion #s 2 or 3. Therefore, all individuals who meet the first criterion should have the opportunity to participate in the review, drafting, and final approval of the manuscript."

This is particularly important for ensuring that individuals who have not traditionally been offered authorship opportunities are recognised when their contributions meet the chosen criteria. This can include research technicians, data infrastructure specialists, librarians, information specialists (who may run searches, write up articles, etc.), fieldworkers or community partners (in co-produced research – patients, community and indigenous society members, carers, etc.). Contributions to experimental design, data acquisition, or analysis might fulfil authorship criteria [4,5].

Additionally, anyone involved in the early stages of a research project should be offered the opportunity to participate in manuscript writing and approval, ensuring that their contribution is recognised, to ensure accountability and the ability to take public responsibility for the work. Their inputs should not be fabricated or exaggerated to mislead others, and all noted contributions must be authentic.

Aligning with agreed criteria

When assigning authorship, ensure all decisions align with the agreed criteria. You should avoid offering 'gift' authorship to individuals who have not met the criteria, but whose name lends credit or visibility to the work. For example, securing funding, providing datasets, or supplying published materials, resources, or biological samples, such as through a material transfer agreement (MTA), does not, on its own, justify authorship, although these contributions should be appropriately acknowledged.

Maintaining transparency when authorship is declined

Declining authorship means an individual chooses not to be listed as an author. While this is a personal choice, it raises questions of accountability if their contribution remains part of the published work. If the individual meets authorship criteria but declines authorship, they should give their reasons in writing, and this should be documented. The remaining authors must then assess whether to keep the contribution, checking relevant organisational and journal policies. If the contribution is retained, evidence of the declined authorship should be provided to the journal on submission. With the individual's consent, they can be acknowledged instead. The decision should be reviewed, and any disclosure requirements carefully considered.

Large authorship groups

The ICMJE criteria also apply when authorship needs to be assigned to large numbers of research collaborators – a situation that is more common in science, technology, engineering and mathematics (STEM) than in AHSS research disciplines. Although authorship decisions can be more complex in larger groups, particularly in interdisciplinary and/or global research collaborations or those with individuals outside formal research roles, it is still essential to adhere to the principles of responsible authorship outlined in this guidance.

Fair and equitable authorship decisions can be supported by practices such as keeping records of discussions (such as project logs, emails, meeting minutes, video recordings, or shared documents created using collaborative tools like Google Docs or Sheets) and using a clearly defined authorship strategy agreement.

In global partnerships, it is important to remain conscious of inequitable behaviours that might influence attribution of authorship, particularly when collaborating with contributors from Low- and Middle-Income Countries (LMICs), and with different roles and from different sectors (e.g. charities) [6,7].

Mapping contributor roles

Mapping contributor roles against the CRediT taxonomy (or an adapted form) can be a practical way to guide discussion and support transparent decision-making. The British Trust for Ornithology offers a useful example of how to do this.

Author position and number

A common source of questions and disputes is the ordering of an authorship list. As with authorship criteria, there are no universally accepted standards that determine how individuals should be positioned within an authorship list. Rather, ordering is often shaped by disciplinary customs, practices and principles.

Listing alphabetically

A common approach to author positioning is based solely on the alphabetical ordering of names.

Listing by contribution

In some disciplines, the position of authors in the list can also be determined by the level of contribution relative to that of the other authors. In this type of listing approach, the authors who contribute the most appear at the start of the authorship list.

First author

In the relative contribution system, the first or lead authorship position is seen as the most important and desirable, as it indicates the individual who contributed the most. Circumstances where two or more authors have equally contributed the most can be indicated through "joint first authorship" (i.e., "co-first author") or "equal contributions" [8], using a symbol such as an asterisk. Disputes relating to the ordering of co-first authors should not arise, as co–first authorship reflects equal contribution and should be treated accordingly.

Last author

The last author position is often reserved for a senior author, such as a principal investigator, provided they meet authorship criteria. In some fields, the second-to-last position can also signify seniority. Senior authors can also be acknowledged with equal contribution indicators where appropriate.

Corresponding author

A corresponding author is often the author who submits an article to the journal. The ICMJE defines the corresponding author as the "individual who takes primary responsibility for communication with the journal during the manuscript submission, peer-review, and publication process." [2]. The corresponding author designation is considered by some authors to be desirable, with its perceived prestige being higher in some countries than in others.

The role of a corresponding author is to assume overall responsibility for the article and oversee compliance with journal or publisher guidelines. The corresponding author is generally expected to be the primary point of contact for post-publication queries, and their email address is provided in the published article so enquiries can be directed to them.

The corresponding author position can be shared between individuals (i.e., co-corresponding authors). This arrangement should be mutually agreed during the planning stage of a research project. It is important to note that this is not a universal practice and can vary between countries, disciplines and journals [9].

A corresponding author should be selected based on their ability to fulfil the associated responsibilities, not on funding considerations (many publishers determine eligibility for open access fee waivers or institutional agreements based on the corresponding author). Assigning the corresponding author role solely for financial reasons can undermine fair authorship practices.

Number of authors

While some journals or disciplines may limit author numbers, this should not affect the editorial handling of submissions by the journal or publisher. Author numbers have generally risen, especially in some STEM fields, such as genomics and high-energy physics. In contrast, single-author papers remain more common in AHSS disciplines, reflecting differing scholarly norms rather than reduced levels of collaboration. Sole authors bear full responsibility for their work; nonetheless, potential authorship disputes can still arise.

Consortium

If authors have contributed to an article as part of a consortium, the consortium can be listed as an author. The names of the individual contributors are then included in the 'Acknowledgements' section. Just as with a corresponding author, a point of contact for the consortium should be provided. A case study of this approach is discussed in The Turing Way.

Authorship changes and affiliations

Changes to authorship after the submission of a manuscript are often legitimate, especially if additional work was performed to address reviewer comments. However, due to the rising concerns over the sale of authorship, some journals are conducting closer checks of authorship changes, both before and after peer review. In keeping with COPE advice, some journals require authors to complete a form to explain the reasoning for any authorship changes, signed and approved by each co-author. Verification of identity is important during this process (see *Verification of author identity*).

Name changes

Changes to the name of an author can be recorded in a research contributor's Open Researcher and Contributor ID (ORCiD), but some authors might wish to change their names on published outputs retrospectively.

There is consensus that retrospective name changes can be made without a formal correction (see COPE guidance on author name changes [10]).

Contribution changes

Contributions can change during the revision process of a manuscript, including before or after submission for publication and during the peer review process. This might impact author ordering and position.

Addition of authors

To reduce the inappropriate addition of authors, journals can decline requests to change the authorship during or after the editorial process. Many do not allow anyone who was not an author on the original submission to become an author unless the request is investigated.

Removal of authors

There are valid reasons to request the removal of an author before publication, for example, if an individual left the project before contributing substantially to the work, and their contribution would be more appropriately recognised in the acknowledgements section.

In certain contexts, such as during a political or economic crises, removal may be necessary to protect individuals whose academic freedom may be hindered, or when publishing may be used as a tool of repression[11] [12]. COPE's position statement [11] on how political issues affect authorship emphasises the need for careful assessment on a case-by-case basis and advises that serious threats to human safety should be prioritised over specific publication ethics principles. In these situations, the removal of authors should be communicated in the acknowledgements section with as much transparency as safety allows, and journals should keep internal records to preserve accountability for the manuscript [13].

In other cases, requests to remove authors can be motivated by a desire to disassociate from them for reasons unrelated to their contributions to the output, for example, if they are accused of misconduct or criminality unrelated to their work.

If someone is removed as an author, their role and contribution must be acknowledged unless there are compelling reasons not to do so. Removing an author without consent, despite them contributing substantially to the research and meeting authorship criteria, constitutes a breach of research integrity (see section on *Breaches of research integrity in authorship*).

Deceased authors

If an author dies before or after manuscript submission, the remaining authors will need to decide whether that person remains an author, taking organisational and publisher guidelines into consideration. When deceased individuals are included as authors, it is generally indicated via a dagger symbol (†) next to their name in the authorship list.

Listing deceased individuals as authors can raise concerns about author accountability and other ethical dilemmas – for example, not all of a deceased coauthor's competing interests may be known to the other authors. Nunan D., and

Aronson J., *et al.*, (2024) have created a table listing ethical and practical problems raised by posthumous authorship and proposed solutions [14].

When handling manuscripts with deceased authors, publishers might request that the next of kin or the executors of the deceased person's estate confirm that the person agreed to be an author and substantially contributed to the work. For legal reasons, however, publishers might not be able to include deceased individuals as authors, even when there is an alternative author available to sign a publishing agreement on behalf of the authorship team [15]. In these cases, institutions and publishers can recommend that the author is included in the acknowledgements section instead.

Authorship changes in physical outputs

Changing authorship in physical outputs, such as printed books or musical compositions, is particularly complex after publication. Once released, the original author list remains in circulation, which can limit the effect of any correction.

Authorship details are typically formalised through the original publishing contract, and any post-publication amendments may have legal and financial implications. These can include matters related to assigning royalties (e.g. Performing Right Society for Music), copyright, and indexing (e.g., assigning a new International Standard Book Number (ISBN).

Moreover, altering authorship after publication can also result in inconsistent or misleading attributions in bibliographic databases (e.g. Web of Science, Scopus or CrossRef). Where a correction is agreed by all authors and the publisher, a formal notice may be issued on the publisher's website, with digital versions and future print editions updated accordingly.

These challenges underscore the importance of assigning authorship and contributorship carefully and transparently at the outset, in accordance with the principles outlined in this guidance. Doing so helps safeguard research integrity and reduces the risks of disputes.

Affiliations

An organisation should only be listed as a research contributor's affiliation if the work was conducted at, or formally connected to, that organisation. The primary affiliation should reflect where the research was actually carried out. Cambridge University Press offers further guidance on affiliations in publishing.

If a researcher has since moved to a different organisation but is publishing work arising from research completed at their previous one, they should list the previous organisation as their affiliation. The research was conducted under its auspices and should be attributed accordingly.

Some publishers allow for both primary and secondary affiliations (e.g., "formerly at Organisation X, now at Organisation Y") *to* reflect the author's current position while maintaining accurate attribution of the research. When the author is acting as the corresponding author, they must provide a current and functioning email address so to ensure they can be contacted.

Authorship credit and ownership rights

Authorship credit recognises someone's instrumental contribution to an output that they share responsibility and accountability for with their co-authors, if present. However, it does not automatically confer legal rights over data, inventions, or commercial products resulting from research. This distinction can be confusing and complex to navigate.

Typically, authors own the copyright in their publication. However, copyright is a separate legal concept from authorship and is not covered in detail in this guidance. For further information, refer to guidance such as the UK Government's *Ownership of copyright works* [15] and JISC's *Publishing under the UKRI open access policy: copyright and Creative Commons licences* [16].

Intellectual property rights in many research outputs, such as data, tools or software, are typically owned by the author's employer or the research funder, depending on organisational policy, employment contracts and funding agreements.

Openness and Transparency

Open research practices

In addition to responsible authorship practices, funders or organisations may require researcher contributors to adopt open research practices such as open access publishing, FAIR (Findable, Accessible, Interoperable, Reusable) data principles [17], preprint sharing, and study pre-registration or registered reports.

These practices enhance transparency, reproducibility and trust in research. Notably, pre-registration and registered reports can help prevent authorship disputes by clarifying study design, roles and contributions in advance of data collection and analysis. Incorporating such practices promotes accountability and provides a clear record of who was involved at each stage of the research process. The UK Reproducibility Network (UKRN) has produced a series of open research primers and offers a collection of open research resources.

Competing interests

According to Nature Portfolio journals' policy on competing interests, competing interests are:

> "...financial and non-financial interests that could directly undermine, or be perceived to undermine the objectivity, integrity and value of a publication, through a potential influence on the judgements and actions of authors with regard to objective data presentation, analysis and interpretation".

All potential or actual competing interests should be declared by both authors and contributors, whether these interests are financial or not. It is common for publishers to provide examples of non-financial competing interests that could influence how readers perceive the publication.

Verification of author identity

Most journals have systems to verify that all co-authors agree to a manuscript's submission. This is often managed via a signed form, or by sending confirmation emails to each co-author. Research contributors can also verify their identity by using an Open Researcher and Contributor iD (ORCiD) – a unique, persistent identifier for anyone working in research and innovation. An ORCiD helps ensure that a research contributor's work is correctly attributed to them, regardless of any name changes, variations or changes of affiliation.

Many journal submission platforms require the use of an ORCiD on submission, and they may have an interface for authors to verify their ORCiD profile. ORCiD member organisations can also verify when someone is associated with their organisation.

Institutional email address

It is common practice to list a corresponding author's organisational email address as the primary contact on a manuscript. Using an institutional email address is particularly useful for addressing the rise of fraudulent publications and identity misuse by paper mills, as this can assist in verifying authorship and support organisational action when needed (e.g. to investigate breaches in research integrity). This can also help establish trust in an author's identity, whereas the use of personal email addresses can raise suspicion.

While institutional email addresses are typically preferred, personal addresses are acceptable, particularly for independent research contributors without institutional access or those on short-term/part-time contracts with multiple organisations. Additionally, authors can provide contact details that differ from their listed affiliation, and as was previously mentioned, the affiliation listed should always reflect where the research was conducted.

Pseudonyms

A pseudonym is a fictitious name used by an author in place of their real name. Pseudonym use by authors might be appropriate when they represent a stable public identity relevant to the article, and their real name is not publicly linked to it.

The use of pseudonyms can protect authors who are at risk, such as those associated with authoritarian regimes. In these cases, the author's real identity should still be shared confidentially with journals so they can assess any competing interests. In certain circumstances, journals may allow authors to publish anonymously (see Taylor and Francis - *Anonymous authorship and researchers at risk*). In all cases, however, publishing agreements must be signed using the author's legal name.

Generally, using pseudonyms to avoid scrutiny on controversial topics is not appropriate.

Author responsibilities in post-publication notices

Corrections and retractions

A *correction* is a formal notice issued to address errors or inaccuracies in a published research article that do not invalidate the overall findings. Often, the original article is not replaced, but a bi-directional link to a correction notice is published by the journal. However, this will depend on the nature of the inaccuracies and journal policy.

UKRIO has an extensive guide on correcting the scholarly record. See *FAQ: Correcting the scholarly record, and dispelling myths around corrections* [18].

A *retraction* is a formal statement that a published article is withdrawn from the scholarly record. Retractions ensure that the research record remains accurate. They do not indicate the reason a paper may be withdrawn, which could be a breach of integrity or an honest error.

Authorship and retraction

The research community should consider retractions as a means to protect the reputation of authors and the trust and reliability of research. Authors do not all have to agree for a manuscript to be retracted, but it is their responsibility to be aware when their publication should be retracted. As authors agree to be accountable for the work, they cannot withdraw from authorship to avoid retraction (unless they were listed without their permission).

Generally, authorship issues alone do not justify retraction. One exception is when an article is stolen, as this is a form of plagiarism, not an authorship dispute. Another exception is when data underlying the research is used without permission.

Some co-authors might ask for their names to be removed from an article when it is retracted. Such requests are generally not appropriate unless it can be shown that the individual was added to the authorship list without their knowledge.

If an author has been added to an author list without their knowledge or consent, it could result in the article being retracted. Such an inclusion would infringe UK law – specifically, Section 84 of the Copyright, Designs and Patents Act 1988, which protects individuals from false attribution of authorship (see CDPA 1988, Section 84). Anyone responsible for false attribution is open to legal challenge.

Authors may be removed after publication by a formal correction, provided all the authors agree. However, such requests can signal deeper concerns about an article, as a wish to disassociate typically reflects serious issues that outweigh the credit gained from being listed as an author.

Rapidly changing environments that impact authorship

Predatory journals

Predatory journals are lucrative businesses aptly named for their aggressive behaviour of targeting potential authors and exploiting the open access model of publishing. They lack transparency and engage in dishonest behaviour.

A common tactic that predatory journals use is email spam to solicit manuscripts from unsuspecting researchers. These journals often claim to be open access, invite researchers to publish with them without robust peer review, and charge authors an Article Processing Charge (APC) that is undisclosed until acceptance. Another common practice for these journals is to list established researchers as members of their editorial board without their knowledge. The common characteristics of predatory journals are summarised in 14 points by Elmore and Weston, 2020 [19].

Paper mills

According to COPE and STM, paper mills are:

> "...the process by which manufactured manuscripts are submitted to a journal for a fee on behalf of researchers with the purpose of providing an easy publication for them, or to offer authorship for sale." [20].

Since they emerged in the early 2010s, paper mills are having a demonstrable impact on the research record. In a 2022 study, COPE, STM and Maverick Publishing Services raised concerns that paper mills are a serious threat to the integrity of the scholarly record [21]. Paper mills can also operate as predatory journals, producing low-quality but seemingly legitimate articles using plagiarised or stolen content.

Practical advice to avoid predatory journals and paper mills

Authors should be cautious if they receive unsolicited emails requesting manuscript submissions, particularly if the emails look unprofessional (with typographical errors), use incorrect forms of address, and are signed off informally or if they are repeatedly sent.

Red flags for paper mills and predatory publishers include:

1. Unrealistically short times between submissions and acceptances (e.g. 1 month), suggesting little-to-no peer review or quality control
2. Failure to disclose publication fees until after a manuscript's acceptance, rather than listing prices on the journal's website
3. Hijacking or mimicking the names and/or website designs of reputable journals, making them difficult to distinguish. Authors should always check a journal's domain name carefully.

Predatory publishers can also cite fake or non-existent impact factors, falsely claim indexing by academic platforms (e.g., ResearchGate), and/or misuse standard identifiers (e.g., ISSNs, DOIs) to appear reputable.

There are trusted resources to help authors verify that they are submitting to a legitimate, trustworthy publisher, including:

- Predatory Journals, which provides information about known predatory publishers and journals
- Think Check Submit, a helpful resource offering guidance and a detailed checklist to help researchers select trusted publishers for their work.

Artificial Intelligence (AI) use by authors

Accountability as an author

AI tools using large language models (LLMs) are becoming increasingly sophisticated at producing human-like prose. Determining an acceptable level of AI use in authorship must be considered carefully.

It is a serious breach of research integrity for authors to intentionally pass off AI-written work as their own without proper disclosure, as it can constitute plagiarism or misrepresentation. AI tools should never be listed as authors, as they are not legal entities, meaning they cannot sign publishing agreements, take responsibility for the research, nor fulfil authorship criteria. COPE provides further guidance on these limitations in *Authorship and AI tools* [22].

When employed in writing, AI should ideally be used to improve spelling, grammar or readability without changing meaning or content. In some instances, AI tools can assist with clarity if the author is writing in a second language, has challenges with writing due to neurodiversity (e.g., dyslexia) or if assistance is needed to adjust text into a certain style (such as for a lay audience).

Maintaining human oversight

Existing guidance and reports [23,24] and EU AI Act [25] emphasise the importance of human oversight and agency when using AI tools for writing assistance. AI should not replace a researcher's ability to generate insights, make interpretations, and draw conclusions.

When using AI to automate tasks like literature reviews or mapping, it is essential to manually verify suggested sources to ensure they are not retracted, fabricated or otherwise questionable, as LLM are known to hallucinate. When authors employ AI for these uses, it is important that they check and verify all content. Authors can use the Currency, Relevance, Authority, Accuracy, and Purpose (CRAAP) test to help assess content [26].

Useful resources to support this include:

- Retraction Watch Database, a searchable database that tracks retracted articles and helps identify problematic research

- PubPeer, a platform for post-publication peer review where researchers can discuss and critique published work
- RedacTek, a tool that flags retracted papers, articles with high author self-citation rates, and publications with comments of concern on PubPeer

Declaring use

For transparency, researchers should disclose how AI tools were used in all writing, code generation, editing, and image and video creation. This information should be included in the methods or acknowledgements section, or another location determined by the relevant publisher, funder, employer of researchers or ethical review body.

Authors should familiarise themselves with guidance from publishers and other authoritative sources on how AI should be disclosed, particularly in relation to their field or discipline. Disclosures should specify the type of AI used, how it was used, and what role it played in shaping the final output. Such transparency helps build trust and protect the credibility of research. Further guidance is available in UKRIO's *Embracing AI with Integrity*.

Useful examples of disclosure requirements include:

- The JAMA Network's Reporting Use of AI in Research and Scholarly Publication
- Nature's AI Policy
- Taylor and Francis' AI Policy

Equitable and fair authorship culture

Resolving disputes

Authors involved in an authorship dispute should familiarise themselves with the dispute resolution processes at their organisation, including where responsibility lies for resolving such disputes and what support is available. Understanding both formal and informal resolution mechanisms, as well as the range of possible outcomes, can help authors navigate disputes more effectively. Generally, authors should be prepared to clearly articulate their concerns and desired outcomes to support a constructive resolution.

For published articles, journals may advise on whether an individual's contributions align with their authorship criteria. However, journal editors cannot and should not mediate authorship disputes.

UKRIO has developed a model authorship dispute procedure that can be used to aid the resolution of authorship disputes.

Breaches of research integrity in authorship

The *Concordat to Support Research Integrity* – which many UK research organisations have committed to and which UK funders often require grant holders to follow – recognises inappropriate authorship as a form of research misconduct. This is because it constitutes a misrepresentation of [27]

> - "involvement, including inappropriate claims to authorship or attribution of work and denial of authorship/attribution to persons who have made an appropriate contribution
> - publication history, through undisclosed duplication of publication, including undisclosed duplicate submission of manuscripts for publication"

In practice, this definition would encompass several forms of authorship misconduct:

- **Denial of authorship** – Excluding individuals who meet established authorship criteria. For example, *orphan authorship* may occur when early career researchers (ECRs) are denied authorship due to power imbalances, where principal investigators or senior researchers wrongly treat authorship as an entitlement rather than something earned through significant contributions [28]

- **Inclusion of individuals whose contribution does not meet authorship criteria** – This includes guest, gift, honorary or purchased authorship, where someone is named as an author despite having made no qualifying contribution. Such inclusion may benefit both the lead author and the added individual, for example, enhanced chances of editorial acceptance, increased visibility, or reinforcement of professional relationships. Typical examples of non-qualifying contributions include providing access to published data or resources or serving in a leadership position such as head of department or PhD supervisor. Recipients may suffer reputational damage if their lack of contribution is exposed, especially if they have not reviewed the work, verified the data, or are unfamiliar with the co-authors. When these inclusions are exposed, it can lead to a loss of credibility, ethical and legal consequences, distorted authorship metrics, wasted research funding, public distrust of research and conflict.

Formal investigations into breaches of research integrity

While many authorship disputes arise from breakdowns in communication, misaligned expectations or differences in academic/professional opinions, some cases involve serious breaches of research integrity. In such instances, formal investigations are needed to understand the circumstances of the dispute. Most research organisations have step-by-step processes for handling allegations of breaches of research integrity.

The role of publishers

When necessary, the organisations where the research was conducted may investigate authorship disputes, as they have access to relevant records such as research notes, underlying data, email records, and other documentation that can determine who did what and when. Publishers, by contrast, are responsible for correcting the published record as needed.

In complex and lengthy cases, particularly those involving legal action or additional issues, journals may publish a *notice of disputed authorship* or an *expression of concern*. If a dispute remains unresolved – for example, if an institution does not respond or conduct an investigation – an *expression of concern* may serve as a permanent record, outlining both parties' claims and the journal's assessment of the facts.

Practical advice for preventing and responding to authorship disputes

Unresponsive authors

When an author becomes unresponsive during the publication process, it can create significant challenges for the integrity and progress of the research. Efforts should be made to contact the individual through all reasonable channels, with all attempts clearly documented. If the author remains unresponsive, co-authors should consult the organisation's authorship or research integrity policy and follow any relevant publisher guidance on how to proceed.

Listing someone as a co-author without their knowledge or permission is a serious breach of research integrity. It may also break the law, specifically, it could violate their moral rights under UK copyright law (Section 84 of the Copyright, Designs and Patents Act 1988), which protects individuals from being falsely named as an author.

To prevent such issues, it is good practice to agree on an authorship plan early in the project. This should include what steps to take if a contributor becomes unresponsive during the publication process.

Openly discussing authorship practices

Poor authorship practices – such as gift, ghost or orphan authorship – are often linked to underlying drivers like the pressure to publish and an unhealthy research culture. While inappropriate authorship attribution appears to be prevalent across disciplines, it can be mitigated through proactive measures. Following a clear set of authorship guidelines – such as those presented in this guidance – and engaging in open discussions about good authorship practices can serve as a preventative intervention that reduces the space and opportunity for poor authorship conduct and practice.

Seeking confidential advice

If research contributors are unsure of how to resolve an ongoing authorship dispute, they should confidentially seek guidance from research integrity professionals, such as their organisation's Research Integrity Officer. There may also be other colleagues they can approach for confidential advice, such as research integrity champions, advisors, or chairs of research ethics committees.

If preferred, researchers can also speak to someone outside their organisation. UKRIO offers free, confidential and expert advice on all aspects of research integrity. Its Advisory Service is available to anyone involved in research in the UK, across all disciplines.

Conclusion

Good practice in authorship is a fundamental aspect of research integrity, reflecting accountability, credit and transparency. This guidance has outlined key principles and practical advice to support responsible authorship practices across disciplines and contexts. From defining authorship and contributorship to addressing disputes and emerging challenges such as AI and predatory publishing, it aims to support a culture that values fairness, openness and accountability.

Through encouraging early and ongoing dialogue, aligning with clearly defined criteria and promoting transparency in contributions and decision-making, research contributors, organisations, and publishers can work together to ensure authorship accurately and fairly represents all contributors' roles in the outputs of research.

Ultimately, creating and maintaining a fair and equitable authorship culture is a shared responsibility, one that demands communication and commitment from everyone involved in the research process.

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