



WHAT IS A SUBSTANTIAL CONTRIBUTION TO A PAPER?

By Sven Hendrix



To become an author on a scientific publication, you need to contribute substantially – but what does that mean? Are there clear criteria, or can this be debated? What about collaborators who only provide data or samples or medical writers who improve the English of the paper? What about ChatGPT and other text generators?



What is an author of a scientific publication?

Authorship in scientific publications implies two things:

1. Public **recognition** and
2. Public **responsibility** for published content.

An author typically provides a so-called *substantial intellectual contribution* to the work, including the conception or design of the work, interpretation of data, and drafting or revising the manuscript for important



intellectual content. Their role does not end with manuscript submission but extends to publication ethics, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Author vs Contributor: What's the Difference?



While every author is a contributor, not every contributor qualifies for authorship. Therefore, many journals request specific, **additional information** concerning the **details of authorship**, such as who conducted the experimental design, data analysis, manuscript writing, and critical revisions.

Only then do authors meet authorship criteria, which involve providing substantial intellectual contributions to the work, agreeing to be accountable for all aspects of the work, and final approval of the version to be published.

These author contributions to a study count more than "just" sample collection, data collection, raising funding, providing infrastructure or computer programs, or improving the manuscript's grammar. According to the strict guidelines of many journals, the contributors are only mentioned in the acknowledgements section.

Authorship vs Contribution: What's the value difference?

In simple terms, authorship is highly attractive, but being mentioned in the acknowledgment section is considered mostly useless from a career perspective. Authorships – and *first* and

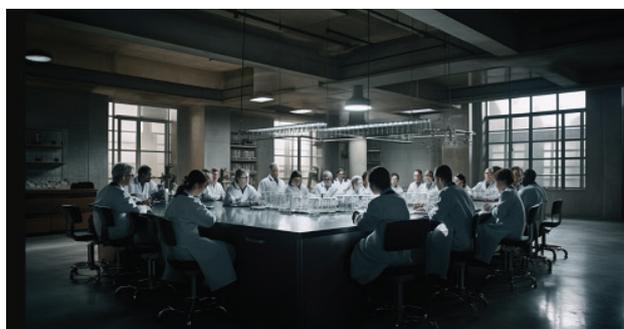


last authorships in particular – are considered as proof of performance. Selection committees for academic positions or grants will judge applicants' productivity exclusively based on their authorships (and indirectly via [bibliometric markers](#)).

In addition, only authorships are recognized in your citation count. In more senior stages of a scientific career, citations and bibliometric marks such as the h-factor become increasingly important for your scientific career. Read more here: [Which bibliometric data are relevant for a research career?](#) and [28 Tips to Get More Citations for Your Publications](#).

Contributions mentioned in the acknowledgment section of a paper may have emotional value but are never considered by selection committees. Thus: **Acknowledgements have no value in science – authorships do.** Read more here: [What is the best publication strategy in science?](#) and [How to become a professor?](#)

The Importance of Substantial Contribution in Authorship Considerations



In the context of authorship, a substantial contribution refers to an intellectual input significant enough to warrant authorship credit. This could involve contributions to the

conception or study design, data acquisition or interpretation, or even critical revision of the manuscript. Simply put, a substantial contribution means that some intellectual work has been done to create the final result.

There are very strict guidelines to help you decide whether a person should be on the author list of a publication. For example, the International Committee of Medical Journal Editors (ICMJE) has provided [guidelines](#) to help researchers decide whether a contributor qualifies as an author or should be included in a manuscript's acknowledgments section.

"The ICMJE recommends that authorship be based on the following **4 criteria**:

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 revising 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."

"All those designated as **authors should meet all four criteria for authorship**, and all who meet the four criteria should be identified as authors."

Most medical journals request these criteria from their authors in addition to ethics committee approval details, clinical trial registration documentation, disclosure of any conflict of interest among authors, as well as funding agencies, charitable organizations, or industry partners who supported the research.

Recognizing non-author contributors in the acknowledgments section is a best practice in scientific publishing to mention the contributions of colleagues who provided technical assistance during the research process.

What Are the Problems of Strict Authorship Guidelines?

Since the ICMJE criteria are very strict, they do not always fit with the reality of academic research. In [another article](#), I described several problems that arise from these strict rules.

The problems start with the following statement of the ICMJE guidelines: "Contributors who meet fewer than all 4 of the above criteria for authorship should not be listed as authors, but they should be acknowledged." Thus, it is – for example – not sufficient to meet the first criterion alone but not the second. Those authors who do not meet **all four** criteria should be moved to the acknowledgments.

Why is this a problem?

This means that the following persons do **not** qualify for an authorship position:

1. Contributors who only provide technical help, lab space, or reagents – even when the study would not be possible without their contribution.
2. Contributors who only rewrite the paper and improve the discussion – even when this contribution is substantial (time, energy, background knowledge, etc.).

Thus, according to the strict ICMJE guidelines, these would be fake authors!

However, there might be an acceptable strategy to make them "real" co-authors of your publication. Read more here: [I have a fake author on my paper – what should I do?](#)

Honorary authorships

Honorary authorship refers to attributing authorship to individuals who have not made substantive contributions to the final version of the manuscript – for example, to the head of the department which has provided the infrastructure or workforce but has not participated in the study at all. These may be considered valuable contributions.

The ICMJE authorship criteria and the recommendations of the National Academies of Sciences clearly specify that authorship must be limited to those who have made substantive intellectual contributions to the work, including the conception, design, execution, or acquisition of data, the drafting, or critical review of the article, and the approval of the final version of the manuscript.

However, due to power dynamics in an institution, a researcher may be forced to include honorary authors. As mentioned above, a possible strategy might be to ask for an additional contribution to your scientific paper. Read more here: [I have a fake author on my paper – what should I do?](#)

The Role of a Corresponding Author

The so-called "corresponding author" is central to managing the manuscript submission and peer review process. Beyond the responsibility for the work at hand, the corresponding author is also responsible for ensuring that all listed authors meet authorship criteria and that every contributor who deserves it is listed as an author. They act as the primary liaison between the publication process, the co-authors, and the journal editor.

In principle, the corresponding author should **ensure the integrity of the work of other group authors**. However, it is evident that the corresponding author can not really control the quality and integrity of the work of the other authors and has to trust them. In the case of allegations of fraud, the corresponding author is the first person to investigate the claims and to contact all co-authors to discuss the further procedure according to the rules of the journal and the responsible institutions.

The Value of Being a Corresponding Author

In my very personal experience, being the corresponding author has the advantage of **being contacted by interested researchers**. This may lead to inspiring discussions or even new scientific collaborations.

On the other hand, there are also unpleasant side effects. The corresponding author is typically the person who is responsible for the acquisition of funding to **pay the publication fees**. This may be a substantial amount of money – especially for open-access publication of scholarly work.

Another task is the administrative work to **get ethical approval**, e. g. for clinical trials. The corresponding author must **address the journal's administrative requirements during submission**, answer **editorial queries of the editorial office**, and provide past work for reference. Another obligation is communicating with the journal about changes in the authors' list, such as changes in the order of authors, inclusion or exclusion of an author, or an author name change.

As mentioned above, in the case of allegations of fraud, it is the primary responsibility of the corresponding author to investigate and handle the claims.

Similar to being mentioned in the acknowledgment section of a research paper, being the corresponding author of an article is usually not valued by selection committees for grants and positions in academia.

Co-authors: Who Qualifies and Who Doesn't?

Co-authors are individuals who have made substantial contributions to a manuscript. They should meet the above-mentioned authorship criteria, including conception and design of the work, analysis of the data, drafting or revising the manuscript, and final approval. Co-authors share responsibility for the content and presentation of the published work, ensuring its accuracy and integrity.

The Order of Authors

The order of authors on a published paper often indicates the level of contribution, with the first author name generally having made the most significant contribution. This can be a contentious issue, especially for junior researchers who may either overestimate their contribution or may

be betrayed. It's crucial to discuss authorship order at the beginning of research projects to avoid authorship disputes and provide examples of activities that justify a higher ranking in the author list.

In my opinion, **authors and contributors should know from the beginning which contribution is expected from them**, in whose lab the research is conducted, which authorship position they can get, and how to meet the criteria for authorship.

Is the Order of Co-Authors Important?

In my humble opinion, it is irrelevant whether you are the second, third, fifth, or fifteenth co-author. An author's contributions are not perceived as substantially different in the middle of the author's list. For recognition and subsequent funding sources, only the first, the last, and equally contributing first and last authorships (marked with an asterisk [*] in the list) are rewarded.

Thus, fighting over the second or third place on a paper is useless. Similarly, asterisks for equally contributing co-authors in the middle of the author's list are probably meaningless.

Large Project and Group Authorship Dilemmas

Group authorship is common in large projects where members of the group each make a substantive contribution to the research. With a large multi-author group, delineating each individual's contribution can be challenging, often resulting in a vague understanding of individual input.

This scenario can lead to unjustified authorships (honorary authorships, ghostwriting) and cause disputes over the order of the authors, which may have significant implications for recognition and career progression.

To ensure fairness and full confidence in the status of authorship, the submitting author should share the following information with the

editorial office: a group name, if applicable, the complete list of members, and the details of each member's contribution.

Medical Writers: Do they qualify as authors?

Medical writers, sometimes involved in drafting and revising a manuscript, play a significant role in the publication process. They bring linguistic expertise to the writing process, ensuring good English, correct grammar, clarity, precision, and adherence to journal guidelines.

However, unless they meet authorship criteria by contributing substantially to the work's design, analysis, or interpretation, they should not be included as authors – according to the authorship guidelines of most journals. Instead, their contribution should be mentioned in the acknowledgment section.

Is an AI text generator an author, a contributor, or a tool?

There is still a substantial debate about using [ChatGPT](#), [Google Bard](#), or other AI text generators in academic research. I dare to predict that using them will quickly become normal, and they will be considered accepted tools, such as grammar correction programs.

There are clear trends – for now – that AI systems will be considered **tools and not contributors**. I expect most journals will soon request that their use be mentioned in each publication's acknowledgment section. Thus, AIs will not be considered as (co-)authors in the list of authors. However, this may change soon with the increasing capabilities of the AIs.

Authorship Disputes: When and How Do They Arise?

Unfortunately, the journal guidelines and ICMJE rules are very strict and are not necessarily adapted to the academic realities. Due to political reasons, young scientists may find their names omitted or relegated to less prominent positions on the author's list. Read more about authorship misconduct in this [article by A. A. Khalifa](#).

The power imbalance in a research group between young researchers and their more experienced superiors poses a significant obstacle, making it difficult to resolve these disputes amicably. Despite these realities, the ICMJE and most journal guidelines adhere strictly to their rules, often advocating for authors to settle disputes amongst themselves. This approach fails to account for the prevailing power dynamics.

Read more here: Zen Faulkes: Resolving authorship disputes by mediation and arbitration, [Res Integr Peer Rev. 2018; 3: 12](#).

FAQ

How are substantial contributions to a paper measured?

Substantial contributions to a paper are primarily intellectual; thus, it is notoriously difficult to measure them quantitatively. Individual contributions that count are: designing the study, interpreting data, and drafting or revising the manuscript. They extend beyond mere technical tasks and imply the author's accountability for the accuracy and integrity of the work.

Can AI text generators like ChatGPT be considered authors?

AI text generators like ChatGPT are typically considered either tools or contributors like medical writers but not authors. Their contributions are usually mentioned in the acknowledgment section.

How is the order of authors determined in a scientific publication?

Ideally, the order of authors on a published paper should signify the level of contribution, with the

first and last authors usually having made the most significant contributions.

The order of the co-authors (between first and last author) probably has no consequences for your science career. Thus, it is probably irrelevant whether you are, for example, co-author number 3 or number 6.

Acknowledgments

I have used AI systems, including Grammarly and ChatGPT, to enhance the English and comprehensiveness of this article. This post may contain affiliate links, meaning I get a small commission if you decide to purchase through my link. Thus, you support smartsciencecareer at no cost to you!

Recommended reading

- » [I have a fake author on my paper – what should I do?](#)
- » [How To Write Faster: 19 Efficient Ways To Finish My Publication](#)
- » [28 Tips to Get More Citations for Your Publications](#)
- » [10 simple strategies to increase the impact factor of your publication](#)
- » [Should I aim for co-authorships on high-impact papers?](#)
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