

Guidelines for authors

Writing and formatting

Title

The title should be concise, omitting terms that are implicit and, where possible, be a statement of the main result or conclusion presented in the manuscript. Abbreviations should be avoided within the title.

Witty and creative titles are welcome, but only if relevant and within measure. Consider if a title meant to be thought-provoking might be misinterpreted as offensive or alarming. In extreme cases, the editorial office may veto a title and propose an alternative. Authors should avoid:

- titles that are a mere question without giving the answer
- unambitious titles, for example starting with 'Towards,' 'A description of,' 'A characterization of' or 'Preliminary study on'
- vague titles, for example starting with

apart from species name.

Abstract

As a primary goal, the abstract should make the general significance and conceptual advance of the work clearly accessible to a broad readership. The abstract should be no longer than a single paragraph and should be structured, for example, according to the [IMRAD format](#). For the specific structure of the abstract, authors should follow the requirements of the article type or journal to which they're submitting. Minimize the use of abbreviations and do not cite references, figures or tables. For clinical trial articles, please include the unique identifier and the URL of the publicly accessible website on which the trial is registered.

Manuscript length

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should be those appropriate for your field and the research itself. You may insert up to 5 heading levels into your manuscript (i.e 3.2.2.1.2 Heading Title).

For Original Research articles, it is recommended to organize your manuscript in the following sections or their equivalents for your field.

Introduction Succinct, with no subheadings.

Materials and methods This section may be divided by subheadings and should contain sufficient detail so that when read in conjunction with cited references, all procedures can be repeated. For experiments reporting results on animal or human subject research, an ethics approval statement should be included in this section (for further information, see the 'Bioethics' section of our [policies and publication ethics](#).)

Results This section may be divided by subheadings. Footnotes should not be used and must be transferred to the main

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Templates

If working with Word please use our [Word templates](#). If you wish to submit your article as LaTeX, we recommend our [LaTeX templates](#). For LaTeX files, please ensure all relevant manuscript files are uploaded: .tex file, PDF, and .bib file (if the bibliography is not already included in the .tex file).

During the [interactive review](#), authors are encouraged to upload versions using track changes. Editors and reviewers can only download the PDF file of the submitted manuscript.

Language editing

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Editage We recommend the language-editing service provided by our external partner Editage to authors who believe their manuscripts would benefit from professional editing. These services may be particularly useful for researchers for whom English is not the primary language. They can help to improve the grammar, syntax, and flow of your manuscript prior to submission. Frontiers' authors will receive a 10% discount using this link: editage.com/frontiers.

The Charlesworth Group We recommend the Charlesworth Group's author services, with a long-standing track record in language editing and proofreading. This is a third-party service for which Frontiers' authors will receive a 10% discount using this link: www.cwauthors.com/frontiers.

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inclusive language policy. When preparing your manuscript for submission, take a mindful approach towards personal biases and a concerted effort to limit their influence. Authors should remove any suggestion or implication of superiority or inferiority of one person over another based on age, gender, race, ethnicity, culture, sexual orientation, disability, religion, or socio-economic class. We ask authors to use inclusive language practices and awareness of diversity, equity, and inclusion into their research and keep it at the forefront during the composition of their findings.

External guidance that may be useful is available at C4DISC's [Guidelines on Inclusive Language and Images in Scholarly Communication](#).

Furthermore, when drafting your work, please take into account the following considerations

In general, seek to avoid:

- language that could be deemed

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research.

Remember, the language we use can influence perceptions, evoke emotions, and shape perspectives. Let's work together to nurture an inclusive, respectful, and empowering discourse in science.

Search engine optimization

There are a few simple ways to maximize your article's discoverability and search results.

- Include a few of your article's keywords in the title of the article
- Do not use long article titles
- Pick 5-8 keywords using a mix of generic and more specific terms on the article subject(s)
- Use the maximum amount of keywords in the first two sentences of

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same as a caption, as it provides a description of the entire image. It is included in the manuscript alongside the image, but in the background, not visible on the page.

Good alt text will be specific, concise, and not overly descriptive. It should include any essential text or data that appears on the image and would be lost if a user couldn't see it.

See Harvard University's guide for more [tips on writing good alt text](#).

Why is alt text important?

It allows people using screen reading technology to clearly understand the contents of an image, therefore making your manuscript more accessible for readers with visual impairments. This is also useful for anyone else who can't view the image - if it doesn't load quickly, for instance .

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or editing of manuscripts submitted to Frontiers.

Use of AI to create written or visual content

Authors should not list a generative AI technology as a co-author or author of any submitted manuscript. Generative AI technologies cannot be held accountable for all aspects of a manuscript and consequently do not meet the criteria required for authorship.

If the author of a submitted manuscript has used written or visual content produced by or edited using a generative AI technology, this use must follow all Frontiers guidelines and policies. Specifically, the author is responsible for checking the factual accuracy of any content created by the generative AI technology. This includes, but is not limited to, any quotes, citations or references. Figures produced by or edited using a generative AI technology must be

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in the supplementary files for the manuscript.

The entire document should be single-spaced and must contain page and line numbers in order to facilitate the review process. The manuscript should be written using either Word or LaTeX. See above for templates.

Abbreviations and nomenclature

The use of abbreviations should be kept to a minimum. Non-standard abbreviations should be avoided unless they appear at least four times, and must be defined upon first use in the main text. Consider also giving a list of non-standard abbreviations at the end, immediately before the acknowledgments.

Equations should be inserted in editable format from the equation editor.

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Astronomical objects should be referred to using the nomenclature given by the International Astronomical Union (IAU) provided [here](#).

Life Science Identifiers (LSIDs) for ZOOBANK registered names or nomenclatural acts should be listed in the manuscript before the keywords. An LSID is represented as a uniform resource name (URN) with the following format:
urn:lsid:<Authority>:<Namespace>:
<ObjectID>[:<Version>]

For more information on LSIDs please see the 'Code' section of our [policies and publication ethics](#).

References

Preparing and

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posts, website content), as well as anonymous sources or commercial websites should be avoided or kept to a minimum

- Authors should avoid citing content that is not directly relevant to the scope of the article and the journal
- Reference lists should reflect the current status of knowledge in the field, avoid bias, and not include a high proportion of citations to the same authors or sources, school of thought, etc.
- The length of the reference list should be appropriate depending on the article type, covering the relevant literature through sufficient referencing
- Authors should ensure that references are accurate, that all links are accessible, and that the citations/references adhere to the reference styles outlined below

Frontiers' journals use one of two reference styles, either Harvard (author-date) or Vancouver (numbered). Please

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communications should be cited within the text only, for article types that allow such inclusions

- For accepted but unpublished works use 'in press' instead of page numbers
- Data sets that have been deposited to an online repository should be included in the reference list. Include the version and unique identifier when available
- Personal communications should be documented by a letter of permission
- Website URLs should be included as footnotes
- Any inclusion of verbatim text must be contained in quotation marks and clearly reference the original source
- Preprints can be cited as long as a DOI or archive URL is available, and the citation clearly mentions that the contribution is a preprint. If a peer-reviewed journal publication for the same preprint exists, the official journal publication is the preferred source. See the preprints section for each reference style below for more

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six authors, followed by et al. and the year of publication in brackets.

- Alphabetical order is followed for the reference list.

Reference examples

Article in a print journal Sondheimer, N., and Lindquist, S. (2000). Rnq1: an epigenetic modifier of protein function in yeast. *Mol. Cell.* 5, 163-172.

Article in an online journal Tahimic, C.G.T., Wang, Y., Bikle, D.D. (2013). Anabolic effects of IGF-1 signaling on the skeleton. *Front. Endocrinol.* 4:6. doi: 10.3389/fendo.2013.00006

Article or chapter in a book Sorenson, P. W., and Caprio, J. C. (1998). "Chemoreception," in *The Physiology of Fishes*, ed. D. H. Evans (Boca Raton, FL: CRC Press), 375-405.

Book Cowan, W. M., Jessell, T. M., and Zipursky, S. L. (1997). *Molecular and Cellular Approaches to Neural*

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DOI: 10.3389/fpls.2015.00837

Data Perdiguerio P, Venturas M, Cervera MT, Gil L, Collada C. Data from: Massive sequencing of Ulms minor's transcriptome provides new molecular tools for a genus under the constant threat of Dutch elm disease. Dryad Digital Repository. (2015) <http://dx.doi.org/10.5061/dryad.ps837>

Theses and dissertations Smith, J. (2008) Post-structuralist discourse relative to phenomenological pursuits in the deconstructivist arena. [dissertation/master's thesis]. [Chicago (IL)]: University of Chicago

Preprint Smith, J. (2008). Title of the document. Preprint repository name [Preprint]. Available at: <https://persistent-url> (Accessed March 15, 2018).

Vancouver reference style (numbered)

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consecutively in order of appearance in the text and identified by Arabic numerals in parenthesis

- Use square brackets for physics and mathematics articles
- The abbreviation 'Ref' should not be used, e.g.: [e.g., (1)] should NOT read [e.g. Ref. (1)]
- Style for comparing a citation should follow the number format, e.g. [cf. (1)]. The same applies when using 'see', e.g. [see (46)]
- References should be numbered and listed chronologically, according to the order they appear in the text

Reference examples

Article in a print journal Sondheimer N, Lindquist S. Rnq1: an epigenetic modifier of protein function in yeast. Mol Cell (2000) 5:163-72.

Article in an online journal Tahimic CGT, Wang Y, Bikle DD. Anabolic effects of IGF-1 on bone mineral density in postmenopausal women. J Clin Endocrinol Metab (2002) 85:1191-6.

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Heiland. Berlin: Springer (2002), p. 102–111.

Website World Health Organization. E. coli (2018). <https://www.who.int/news-room/fact-sheets/detail/e-coli> [Accessed March 15, 2018].

Patent Pagedas AC, inventor; Ancel Surgical R&D Inc., assignee. Flexible Endoscopic Grasping and Cutting Device and Positioning Tool Assembly. United States patent US 20020103498 (2002).

Data Perdiguero P, Venturas M, Cervera MT, Gil L, Collada C. Data from: Massive sequencing of Ulms minor's transcriptome provides new molecular tools for a genus under the constant threat of Dutch elm disease. Dryad Digital Repository. (2015) <http://dx.doi.org/10.5061/dryad.ps837>

Theses and dissertations

Smith, J. (2008) Post-structuralist discourse relative to phenomenological pursuits in the deconstructivist arena. [dissertation/master's thesis]. [Chicago (IL)]: University of Chicago

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1. **Verification:** Authors are responsible for checking the status of all cited works before submission. Lists of retracted articles can often be found in databases such as PubMed and the Retraction Watch database. Authors can check the version of the record which is expected to include a visible notice of retraction.
2. **Disclosure:** If it is necessary to cite a retracted article, authors must clearly indicate the retraction status in the reference list.
3. **Justification:** Authors are encouraged to discuss the reasons for citing the retracted article in the manuscript, explaining its relevance and the implications of its retracted status on the discussion.

Adhering to these guidelines is considered best practice as it helps maintain the

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preprint, this should be mentioned here, in addition to listing the source within the reference list.

Acknowledgements are designed to recognize individuals directly involved in the research. We request that authors avoid personal expressions of gratitude toward figures or entities unrelated or indirectly related to the production of the manuscript. While such acknowledgements are understood to be significant to the authors, they are considered indirectly involved in the research unless they pertain to specific research activities. It remains the responsibility of the authors to ensure that these guidelines are adhered to in the final publication.

Preparing figures, tables, and images

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Figure requirements and style guidelines

Frontiers requires figures to be submitted individually, in the same order as they are referred to in the manuscript; the figures will then be automatically embedded at the end of the submitted manuscript. Kindly ensure that each figure is mentioned in the text and in numerical order.

For figures with more than one panel, panels should be clearly indicated using labels (A), (B), (C), (D), etc. However, do not embed the part labels over any part of the image, these labels will be replaced during typesetting according to Frontiers' journal style. For graphs, there must be a self-explanatory label (including units) along each axis.

For LaTeX files, figures should be included

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Figure captions should be placed at the end of the manuscript. Figure panels are referred to by bold capital letters in brackets: (A), (B), (C), (D), etc.

Image size and resolution requirements

Figures should be prepared with the PDF layout in mind. Individual figures should not be longer than one page and with a width that corresponds to 1 column (85 mm) or 2 columns (180 mm).

All images must have a resolution of 300 dpi at final size. Check the resolution of your figure by enlarging it to 150%. If the image appears blurry, jagged, or has a stair-stepped effect, the resolution is too low.

The text should be legible and of high quality. The smallest visible text should be no less than eight points in height when viewed at actual size.

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Chemical structures

Chemical structures should be prepared using ChemDraw or a similar program. If working with ChemDraw please use our [ChemDraw template](#). If working with another program please follow the guidelines below.

- Drawing settings: chain angle, 120° bond spacing, 18% width; fixed length, 14.4 pt; bold width, 2.0 pt; line width, 0.6 pt; margin width, 1.6 pt; hash spacing, 2.5 pt. Scale 100% Atom Label settings: font, Arial; size, 8 pt
- Assign all chemical compounds a bold, Arabic numeral in the order in which the compounds are presented in the manuscript text.

Table requirements and style guidelines

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Tables which are not according to the above guidelines will cause substantial delay during the production process.

Accessibility

Frontiers encourages authors to make the figures and visual elements of their articles accessible for the visually impaired. An effective use of color can help people with low visual acuity, or color blindness, understand all the content of an article.

These guidelines are easy to implement and are in accordance with the W3C Web Content Accessibility Guidelines ([WCAG 2.1](#)), the standard for web accessibility best practices.

Ensure sufficient contrast between text and its background People who have low visual acuity or color blindness could find it difficult to read text with low contrast background color. Try using colors that

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information like charts and graphs can be hard to read when only color is used to distinguish the data. Try to use other visual aspects to communicate information, such as shape, labels, and size. Incorporating patterns into the shape fills also make differences clearer.

Preparing supplementary material

Selecting supplementary material

Data that are not of primary importance to the text, or which cannot be included in the article because they are too large or the current format does not permit it (such as videos, raw data traces, and

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Appendices

Appendices are optional and can be used to present further detail on information included in the main body of the article, such as the derivation of an equation, short supplementary tables, or supplementary methods.

Appendices should be no more than one page long and count towards the overall manuscript length and word count.

Appendix content **longer** than one page should be included in the supplementary material section instead.

File type requirements

The supplementary material can be uploaded as:

- data sheet (Word, Excel, CSV, CDX,

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Article type

Frontiers requires authors to select the appropriate article type for their manuscript and to comply with the article type descriptions defined in the journal's 'Article types' page, which can be seen from the 'For authors' menu on every Frontiers journal page. Please pay close attention to the word count limits.

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All names are listed together and separated by commas. Provide exact and correct author names as these will be indexed in official archives. Affiliations should be keyed to the author's name with superscript numbers and be listed as follows:

- Laboratory, Institute, Department, Organization, City, State abbreviation (only for United States, Canada, and Australia), and Country (without detailed address information such as city zip codes or street names).

Example: Max Maximus¹ Department of Excellence, International University of Science, New York, NY, United States.

Correspondence

The corresponding author(s) should be marked with an asterisk in the author list. Provide the exact contact email address of the corresponding author(s) in a separate section. Example: Max Maximus*

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- **First authorship:** These authors share first authorship
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- **Equal contribution and first authorship:** These authors contributed equally to this work and share first authorship
- **Equal contribution and senior authorship:** These authors contributed equally to this work and share senior authorship
- **Equal contribution and last authorship:** These authors contributed equally to this work and share last authorship

Example: Max Maximus 1†, John Smith 2† and Barbara Smith 1 †These authors contributed equally to this work and share first authorship

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published, they do not have to be inserted in the Frontiers submission system individually. However, in the manuscript itself, provide a section with the name of the consortium/group as the heading followed by the list of collaborators, so they can be tagged accordingly and indexed properly.

Example: John Smith, Barbara Smith and The Collaborative Working Group. In cases where work is presented by the author(s) on behalf of a consortium/group, it should be included in the author list separated with the wording 'for' or 'on behalf of.' The consortium/group will not retain authorship and will only appear in the author list.

Example: John Smith and Barbara Smith on behalf of The Collaborative Working Group.

Keywords

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the chosen journal and specialty. We encourage you to consider carefully where to submit your manuscript, as submissions to an unsuitable journal or specialty will result in delays and increase the likelihood of manuscript rejection. If you are submitting to a Research Topic, please also clarify how your submission is suited to the specific topic.

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