

ROAD TO RESEARCH WRITING: BRIEF SUMMARY ON METHODS AND TOOLS

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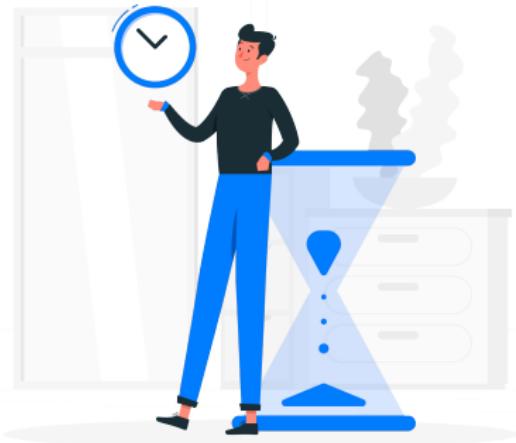
PART 1: BASICS

Ethics in scientific communication



- Scientific research crucially depends on the integrity of the investigators
- Fabrication and falsification clearly are unethical
- The publication should be complete
- Should support the advancement of science

When and what to publish



- Not too early; Not too late
- Enough work with enough results
- Results lead to clear understanding
- Avoid short, incomplete descriptions
- Don't fall for 'publish or perish'

Don't be a prey!

Always remember this:

- Reputation of an investigator is determined by the quality of research done over an extended time
- Large number of low-quality publications is not of benefit to the individual or the profession
- Don't tempt to publish the same material, or material only slightly different, multiple times



Who are authors



- Colleague prepared buffers or did routine computer programming **are not sufficient**
- **Extending research facility** can't be a contribution
- People who made **significant and substantial intellectual contributions**
- The first author is assumed to have made the major contribution to the work
- Often supervisor is designated with corresponding author at the end

Author contribution statement

- intention of recognizing individual author contribution, reducing disputes and facilitating collaboration
- opportunity to share an accurate and detailed description of their diverse contributions
- corresponding author is responsible for ensuring that the descriptions are accurate and agreed by all authors
- role(s) of all authors should be listed, using the relevant categories

Categories: Conceptualization; Methodology; Software; Validation; Formal analysis; Investigation; Resources; Data Curation; Writing - Original Draft; Writing - Review & Editing; Visualization; Supervision; Project administration

Definition: Act of presenting words, ideas, images, sounds or other creative expressions without proper attribution.

What is plagiarism?

-  **Clone:** Submitting someone else's work as your own
-  **Ctrl-C:** Taking large portions of text from a source without alteration
-  **Find & Replace:** Changing key words and phrases but keeping essential content
-  **Remix:** Paraphrasing from several sources
-  **Recycle:** Borrowing from your own work (self-plagiarism)

PART 2: FORMATING

Types of Books



- **Proceeding volumes:** book based on meetings/conferences
- **Monograph:** books that examine a single topic in detail
- **Handbook:** large, multiauthored volumes that discuss a field in depth

Types of journal presentations

- **Articles:** provide important new data and fresh approach to an established subject
- **Notes:** preliminary reports of special significance
- **Communications:** (or letters) - preliminary reports of special significance and urgency subjected length restriction
- **Reviews:** integrate, correlate, and evaluate results from published literature on a particular subject

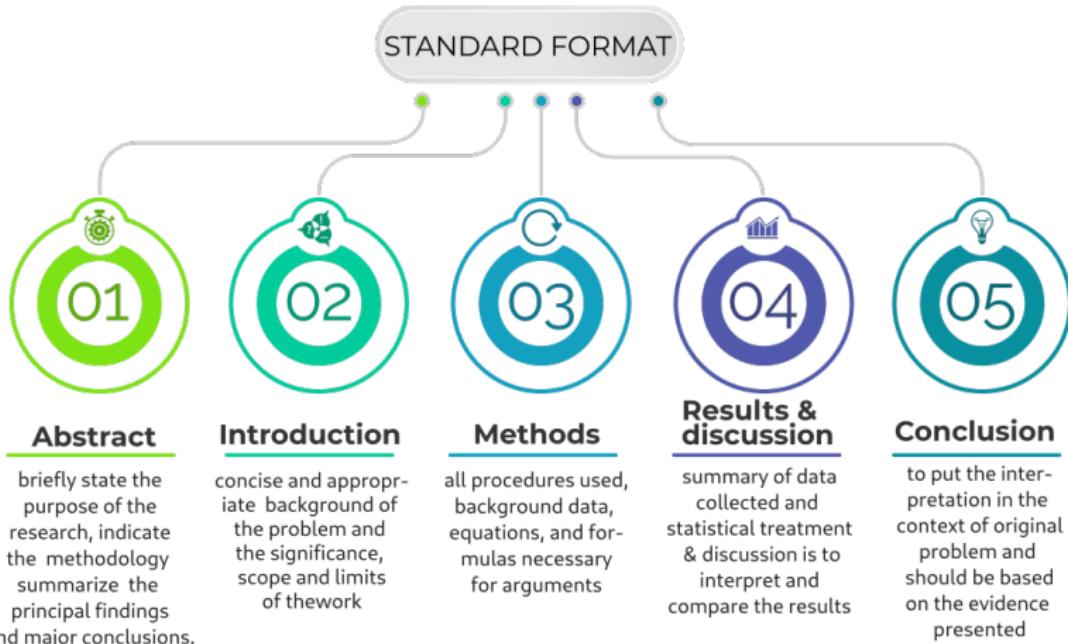


General structure



- define the **problem**, create a **hypothesis**, devise an experiment to **test the hypothesis**, conduct the experiment, and draw **conclusions**
- get a title that will reflect the paper's content and emphasis accurately and clearly within two lines
- extremely important step is to check the **specific requirements of the publication** targeted and follow them

Manuscript structure



- **References:** proper attribution of the contributions of others by appropriate referencing - important ideas and experiments must be cited
- **Acknowledgements:** people who have assisted in the project, but not sufficiently for authorship, and to sponsoring agencies
- **Supporting info:** data relevant to advanced reader and supporting information
- **Rule of thumb:** all aspects of the research should be fully disclosed and reasonable assistance should be given to other researchers

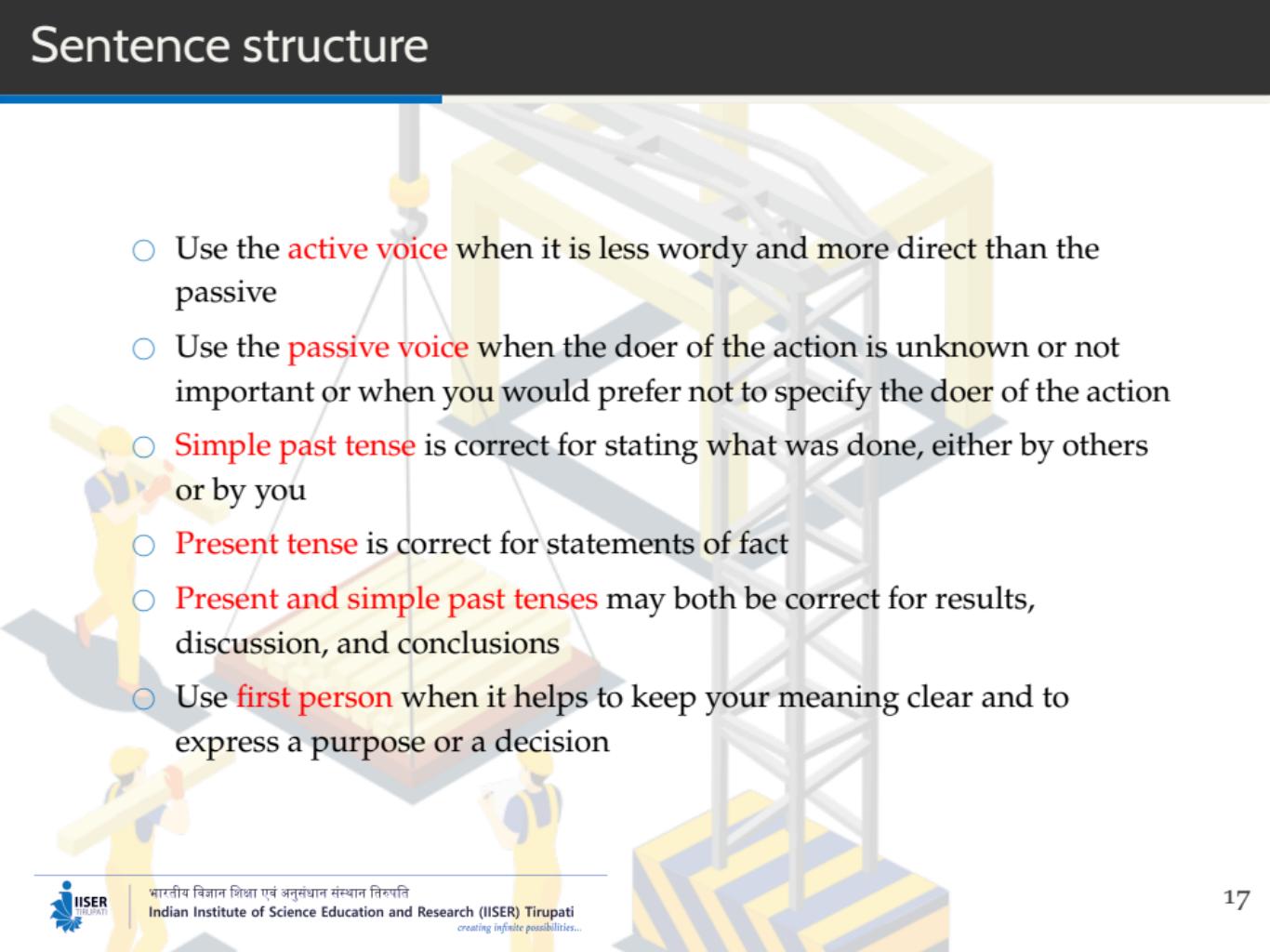
PART 3: LANGUAGE

Sentence structure



- short, simple declarative sentences
- sentences that make statements, rather than pose questions
- straight forward and easy to read
- avoid slang and jargon

Sentence structure

- 
- Use the **active voice** when it is less wordy and more direct than the passive
 - Use the **passive voice** when the doer of the action is unknown or not important or when you would prefer not to specify the doer of the action
 - **Simple past tense** is correct for stating what was done, either by others or by you
 - **Present tense** is correct for statements of fact
 - **Present and simple past tenses** may both be correct for results, discussion, and conclusions
 - Use **first person** when it helps to keep your meaning clear and to express a purpose or a decision

Key to right sentences



- Be brief. Wordiness obscures your message and annoys your readers.
- Omit empty phrases
- Omit excess words
- Omit too much exaggeration
- Write economically (and usually more precisely)

Gender neutral language

- Instead of '**man**', use '**people**', '**humans**', '**human beings**', or '**human species**', depending on your meaning
- Instead of '**manpower**', use '**workers**', '**staff**', '**work force**', '**labor**', '**crew**', '**employees**', or '**personnel**', depending on your meaning
- Instead of '**man-made**', use '**synthetic**', '**artificial**', '**built**', '**constructed**', '**manufactured**', or even '**factory-made**'
- Instead of '**he**' and '**his**', change the construction to a plural form ('**they**' and '**theirs**') or first person
- Using passive voice or second person ('**you**', '**your**', and '**ours**') also works sometimes
- Instead of '**wife**', use '**family**' or '**spouse**' where appropriate

Spacing

- Do not use square brackets, parentheses, or braces **around the symbol** for a quantity to make it represent any other quantity
- Use **italic type** for subscripts and superscripts that are themselves symbols for physical quantities or numbers
- Use **roman type** for subscripts and superscripts that are abbreviations and not symbols
- **Exponents** should follow subscripts
- **Use a slash (/)** in all subscript and superscript fractions, with no space on either side.
- **Leave no space around operators** in subscripts and superscripts
- **Leave no space around other expressions** in subscripts and superscripts, unless confusion or misreading would result

- Use **metric and SI units** in all (possible) technical documents
- Abbreviate units of measure when they accompany numbers
- Leave **a space between** a number and its unit of measure
- Do not use a **period after an abbreviated unit** of measure
(exception: in. for inch)
- Do not define units of measure
- Do not leave **a space between** a number and the percent, angular degree, angular minute, or angular second symbols
- Use $^{\circ}\text{C}$ with **a space after a number**, but no space between the degree symbol and the capital C
- Do not add an 's' to make the **plural of any abbreviated units of measure**. The abbreviations are used as both singular and plural

Mathematical concepts

- Define all **symbols** for first time you use them in the text
- Do not define **standard mathematical constants** such as π , i , and e
- Do not use an **equal sign as an abbreviation** for the word 'is' or the word 'equals' in narrative text
 - eg.** $PV = nRT$, where P is pressure (not where P = pressure)
- Do not use a **plus sign as an abbreviation** for the word 'and' in narrative text
 - eg.** a mixture of A and B (not a mixture of A + B)
- Do not use an **asterisk to indicate multiplication** except in computer language expressions.

Mathematical concepts (cont.)

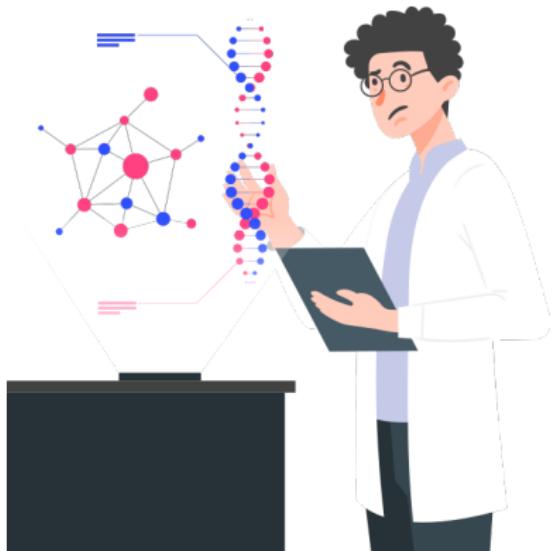
Use italic type for:

- **variables:** T for temperature, x for mole fraction, r for rate
- **axes:** the y axis
- **planes:** plane P
- **components of vectors and tensors:** $a_1 + b_1$
- **elements of determinants and matrices:** g_n
- **constants:** k_B , the Boltzmann constant; g , the acceleration due to gravity
- **functions that describe variables:** $f(x)$

Use boldface type for:

- **vectors**
- **tensors**
- **matrices** and
- **multidimensional physical quantities:** \mathbf{H} , magnetic field strength.

Chemical names



- Greek locants, with no space after the comma
- Use hyphens to separate locants and configurational descriptors
- Do not use hyphens to separate the syllables of a chemical name unless the name is too long to fit on one line
- 'Poly' is a syllabic prefix, not a descriptor, and no special treatment for that

Citing references

Three common citing methods

- By **superscript numbers**, which appear outside the punctuation if the citation applies to a whole sentence or clause
- By **italic numbers** in parentheses on the line of text and inside the punctuation
- By **author name and year of publication** in parentheses inside the punctuation (known as author-date)

Citing references

- If a reference has two authors, give both names joined by the word 'and'
- If a reference has more than two authors, give only the first name listed, followed by 'et al.'
- Do not use a comma before et al.; always use a period after 'al.'
- To cite more than one reference by the same principal author and various coauthors use the principal author's name followed by 'and co-workers' or 'and colleagues'
- When citing more than one reference at one place by number in one of the numerical systems, list the numbers in ascending order and separate them by commas

Graph or Table?



○ Use graphs

- if basic point to be communicated at a glance
- if reader to see trends and relationships

○ Use tables

- if the reader to see exact numbers
- if want to communicate a lot of information with words

Tables

WHEN TO USE TABLES?

- when the data cannot be presented as narrative
- when many **precise numbers** must be presented
- when meaningful **interrelationships** can be better conveyed
- tables **should supplement, not duplicate**, text and figures.

HOW TO CITE TABLES?

- **capitalize the word 'Table'** when it is followed by the table number
- **number tables sequentially** with arabic or roman numerals
- **discuss tables sequentially** so that Table 1 is discussed before Table 2

How to prepare tables?

- formal table should consist of **at least three interrelated columns and three rows**
- if you have only **two columns**, try writing the material as **narrative**
- if the columns do not relate to each other **use a list of items**
- if table has **unusual requirements**, perhaps it should really be a figure
- tables should be **simple and concise**; arrange all data for optimal use of space
- if you have many **small tables**, consider **combining some**
- be **consistent with symbols and abbreviations** among tables and between tables and text
- each table should have a **concise title and appropriate column headings**

Figures

WHEN TO USE FIGURES?

- when the data can be highlighted, clarified and summarizing results
- figures can be graphs of data, photographs, sketches, flow charts, etc.
- line graphs show trends. Bar graphs compare magnitudes
- pie charts show relative portions of a whole
- photographs can provide absolute proof of findings
- excessive number of figures can dilute the value of any individual figure

HOW TO CITE FIGURES?

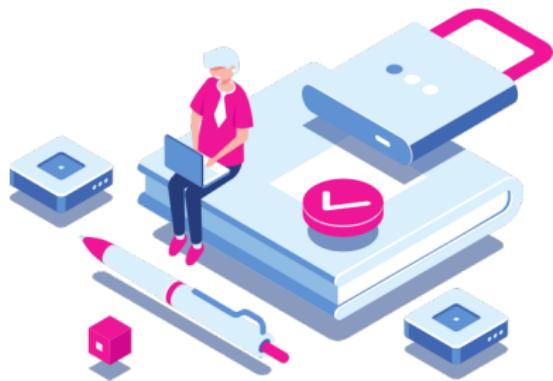
- capitalize the word 'Figure' when it is followed by the table number
- number figures sequentially with arabic numerals
- parts of the figure can be designated as combination of arabic and roman numerals or even alphabets

Overall, figures should give more understanding and be less complex

Figure preparation

- for high quality printing TIFF or EPS formats preferred
- for web-rendering JPEG or GIF formats preferred
- PNG and PDF formats are universal
- set figure resolution to 300 dpi; 600 dpi is preferred for photographs;
scan can be between 800 - 1200 dpi
- use similar font to text - make sure the font copyright
- follow color trends in subsequent graphs

Note on copyright



- most often **publisher own the copyright** of the manuscript
- authors requested to sign a **copyright transfer form**
- an exclusion is paid or **open source journals**
- utilization of data from previous publications require **proper permission**
- **CC license** can be used based on license terms
- all material should be **attributed properly**

PART 4: TOOLS

Types of packages



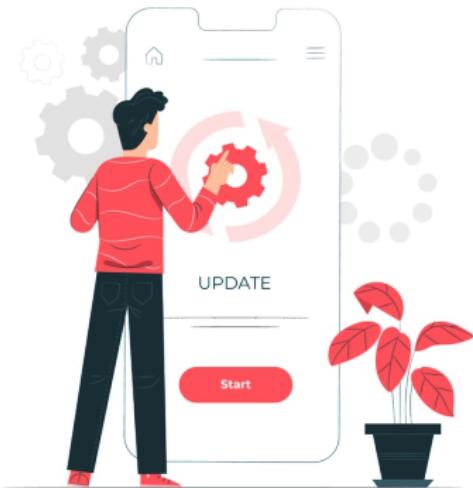
- open source
- freeware
- shareware
- network license
- single user license
- software as a service (SaaS)

WYSIWYG Editors:



- Office packs: Combine word processor, sheets and presentation softwares
- Cloud based tools are preferred now eg: Office 360 & Google Docs
- **LibreOffice** is powerful alternative

Version Control

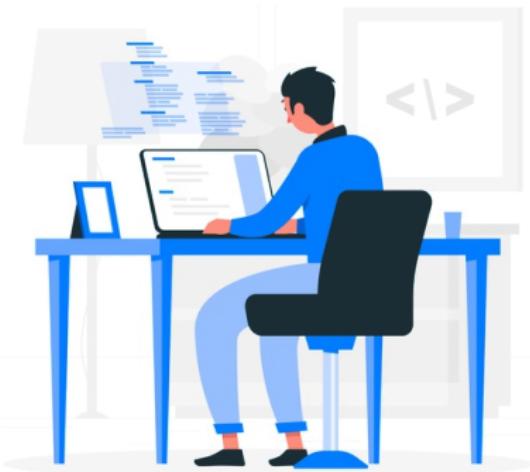


Definition: Version control involves a process of naming and distinguishing between a series of draft documents which lead to a final (or approved) version, which in turn may be subject to further amendments.

- traceability
- identifiability
- clarity
- reduced duplication
- reduced errors

Text based processors

- text based editors are great for version control
- two major languages are:
[LATEX](#) | [MarkDown](#)
- **GUI editors:** Gedit | VS Code | Atom
- **CLI editors:** nano | vim | emacs
- **standalone packages:** Kile | latezila | typora | simplenote
- **repos:** Github | Bitbucket | GitLab



Graphing Packages



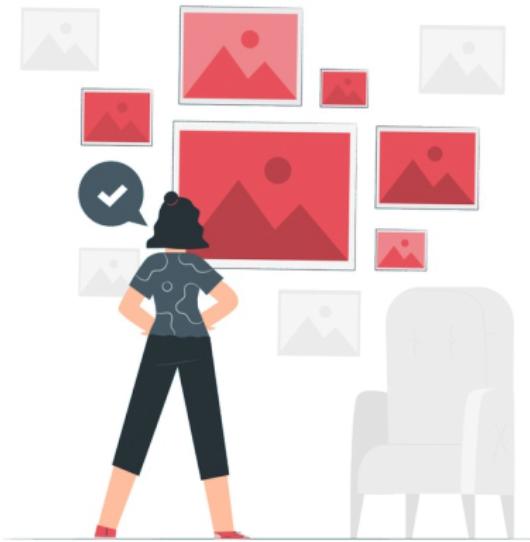
- **GUI packages:** Origin Pro | SciDaVis | Kst | Grace
- **CLI editors:** gnuplot | KMplot
- **Note:** check line densities in MS EXcel
- **others:** XYplot

Simulations

- MatLab | Octave | SciLab
- Mathematica | SageMath | Maxima
- R | GoLang | Python | Julia
- Always check: stackexchange | stackoverflow
- Note on: IPython and Jupyter notebook



Images & drawings



- **Images:** Photoshop | GIMP
- **Drawings:** TGIF | Illustrator | InkScape | CorelDraw
- **3D:** Maya | Blender | Google Sketch | LightWave
- **others:** MS Publisher | LibreOffice Draw

Chemical drawings & simulations

- **Sketch:** ChemDraw | ChemSketch | MarvinSketch
- **Visualization:** Avogadro | Gabedit | Pymol | Mercury
- **Simulation:** Gaussian | ORCA | MOPAC
- **Structure:** IUPAC | COD | RCSB-PDB



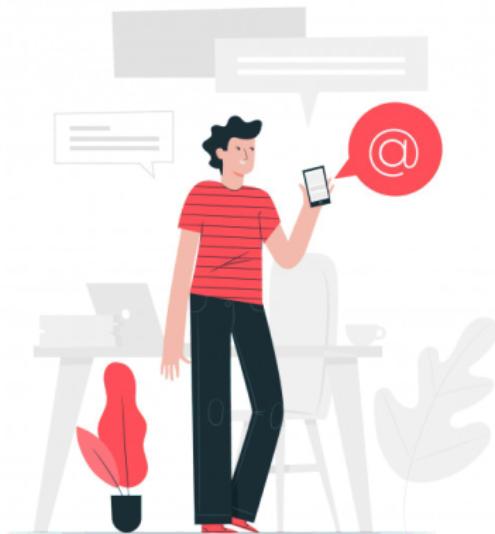
Language tools



- **Grammar:** Built-in tools
- **Online tools:** Grammarly | Language Tools | Slickwrite
- **Others:** WhiteSmoke | Ginger
- **Plagiarism:** Urkund | Prowriting Aid | Paperrater
- Good with python? Check github repos for self checkers

Reference managers

- Mendeley | Zotero | EndNote
- Google Scholar | Scite.ai
- **Bookmarks:** Raindrop | Pocket
- Paperpile | Citavi | JabRef



Preprints & journal selectors

List of preprint servers:

- *Difference between preprint & journal article*
- Arxhive | Zenodo
- ChinaXiv | INA-Rxiv
- Chemarxiv | Bioarxiv | Engrxiv
- OSF Preprints | Preprints.org

Journal selectors: Edanz | Cofactor



SUMMARY

Take home message



- Ethics: ground rules
- When & what to publish?
- Language and formatting
- Which tool to choose?

1. Barrass, R. [Scientists Must Write: A Guide to Better Writing for Scientists, Engineers, and Students](#), 2nd ed.; Routledge: London, 2002.
2. Day, R. A. [Scientific English: A Guide for Scientists and Other Professionals](#), 2nd ed.; Oryx Press: Phoenix, AZ, 1995.
3. Zinsser, W. [Writing To Learn](#); Collins: New York, 1993
4. [AIP Style Manual](#), 4th ed.; American Institute of Physics: New York, 1990
5. [ACS Style Guide](#), 3rd ed.; American Chemical Society: Washington DC, 2006

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