Scientific Writing

魏桐

4/26/2023

华大生命科学研究院
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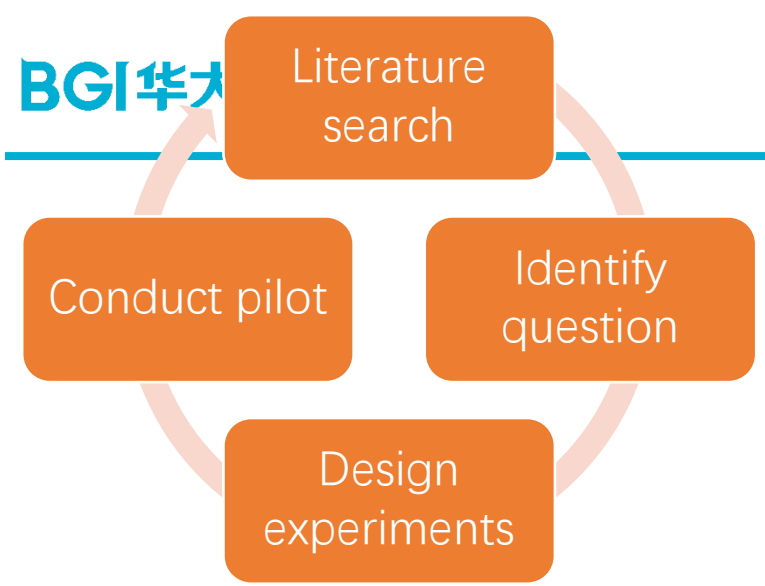
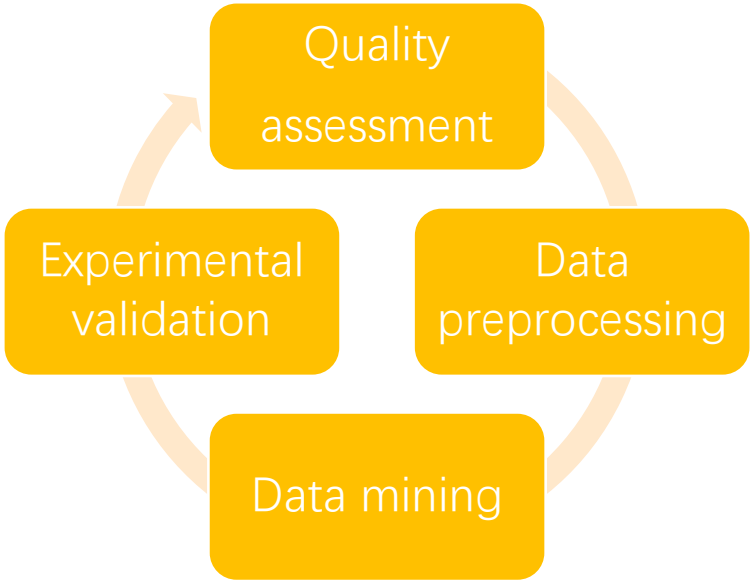
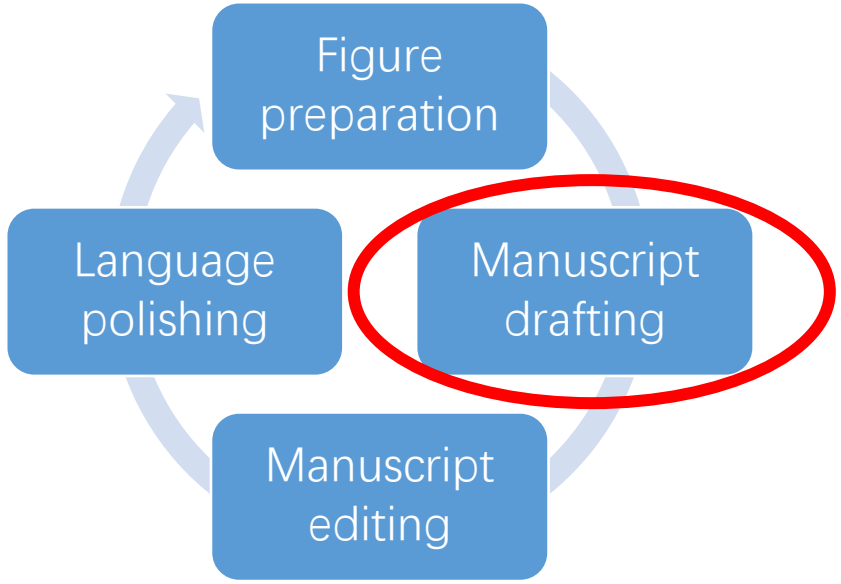
Research cycle



Project design → Data analysis → Manuscript preparation → Submission & revision





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What is scientific writing

- Scientific writing is **a technical form** of writing that **communicates** scientific concepts/findings to other scientists in a written form.

- Depending on the specific scientific genre—a journal article, a scientific poster, or a research proposal, **the details vary but have a greater similarity**.
- Important hallmarks of all scientific writing are,
  - Has to be **logical and organized,**
  - Must be **exact and precise,**
  - Needs to be set **within the context** of published work.

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How to get your work published

- Your research is good…
  - It has novelty.
  - The experiments is well-designed.
  - The results are solid.
  - …
- And more importantly nowadays, your manuscript is **well organized and written**!

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What happens to poorly written papers

- Editors miss the point.
- Editors feel the paper will not pass the reviewing process.
  - Most likely reject.

- Reviewers feel frustrated.
  - Likely reject.
- Reviewers feel confused.
  - Probably raise extra questions or ask for more results.

Writing is important

Writing a manuscript is
as important as doing experiments.

For high-impact journals,
writing is often more important.

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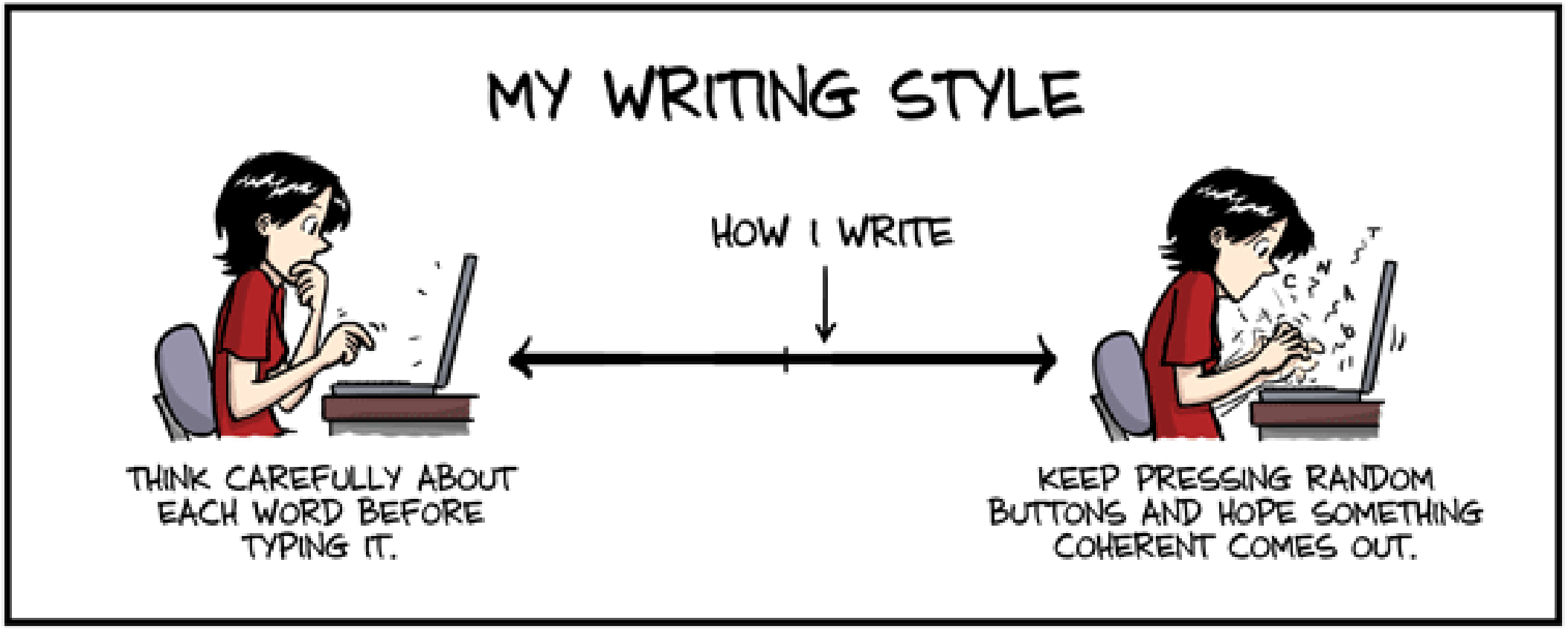
Writing needs practices



https://www.phdcomics.com/

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Key questions related to your research

- **Why** did you do it?
- **How** did you do it?
- **What** did you get?
- **So what** did it mean?

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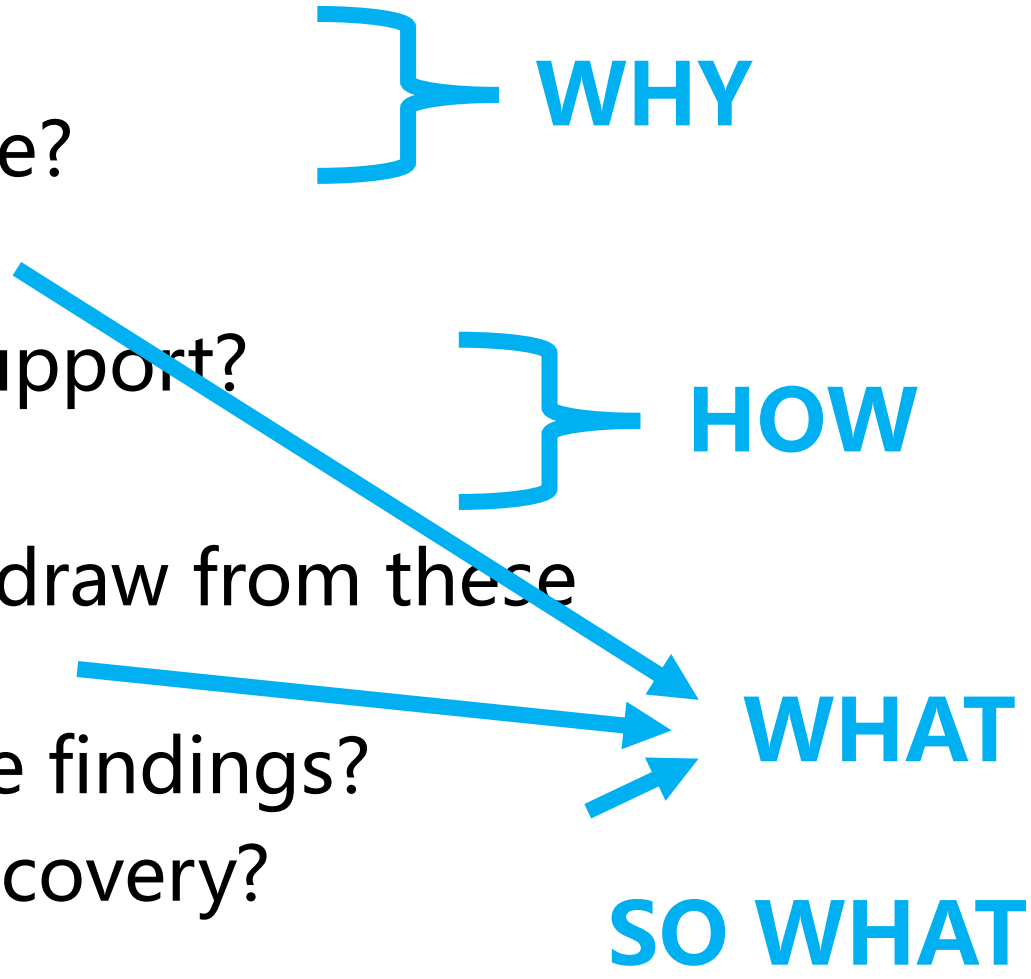
Q&As related to your work

- Why is your work important?
- What problem do you want to solve?
- What is your main discovery?
- What experiments did you do to support?
- How did you do the experiments?
- What specific conclusions can you draw from these experiments?
- What can you conclude from all the findings?
- What is the significance of your discovery?



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Organized in sections

Abstract

- **Background + question**
- **A sentence or phrases about methods**
- **Major discoveries**
- **Conclusion + significance**

WHY → Introduction

HOW → Methods

WHAT → Results

SO WHAT → Discussion

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Well answered in Abstract

- Why did you do it?
  - … is important in organ development/crop science; however, the mechanism remains unclear.
- How did you do it?
  - We carried out a multi-omic approach …
- What did you get?
  - The results showed that genes were associated with …
- So what did it mean?
  - Our work discovered key players and shed light on …

Part I
Manuscript drafting

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3 phases during manuscript preparation

- The preparation phase
  - A **final set of processed data**, assembly, variants, expression, etc.
  - A complete set of **preliminary figures & tables**
- The drafting phase
  - **An story line** with logic
  - Figures + Results & Methods
  - Discussion + Introduction
  - Abstract + Title
- The editing phase
  - Seek for **professional comments**
  - Language polishing

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The preparation phase

- Get all the results together, e.g. processed results (**figures & tables if possible**)
- Get the methods ready, i.e. software, parameters, filtering criteria, etc.
- Scan the literature briefly
- Revisit **the scientific question(s)**

- Conceptualize/visualize your work, and draw the OUTLINE

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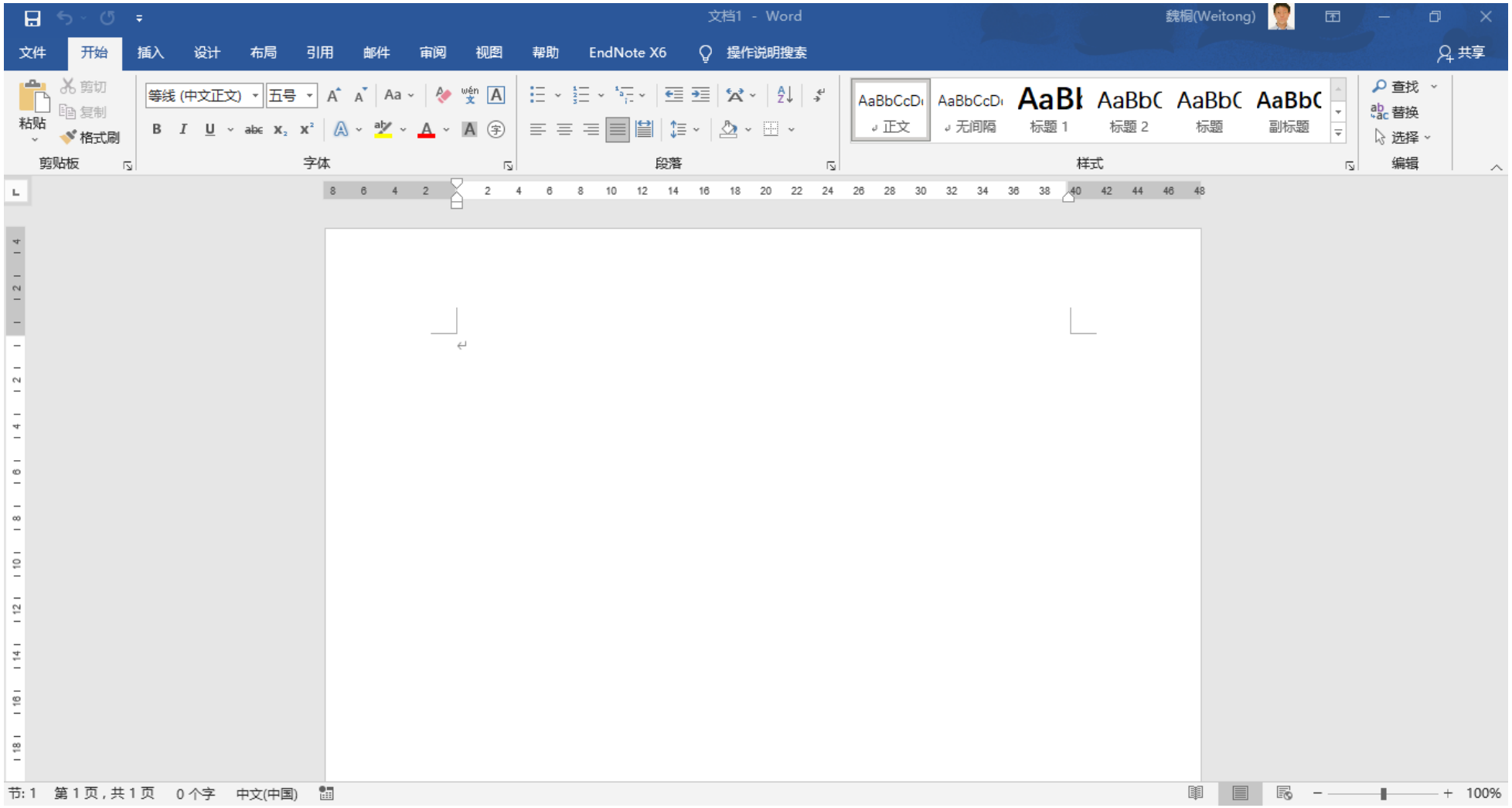
Ready to draft the manuscript!



The drafting phase

- **OUTLINE** guides the drafting
- **BOTTOM-UP** writing

- Write out an rough Abstract from the outline
- Assign a topic sentence for each paragraph in each section
- Image writing for people without any background knowledge

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Outcomes from the drafting phase

- **An rough abstract** with logic
- Main figure layout
- **Results & Methods**
- A rough Discussion
- A rough Introduction
- A revised Abstract if results change
- A working title

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Write a rough Abstract

- It answers the **WHY, HOW, WHAT** and/or **SO WHAT** questions.
- It is a special tool to,
  - Guide figure preparation,
  - Dictate results writing,
  - Review the whole draft.

- **Know your data** and spent some time, say 30 minutes, to draw the outline.

Write Methods

- Describe all the experimental procedures **in details**
  - Experimental materials, species, ecotypes, batches, etc.
  - Treatment, chemicals, concentration, time, etc.
  - Data analysis, software versions, parameters, formats, etc.
- Write methods **after the analyses is done**.

- This is quite straightforward.

Write Results

- Layout figures in **a logical order**
- Combine the figures **related to the same topic**
- Write the simple legends
- Expand into **structured** results

- Write **section by section** if possible
- Write panel by panel if facing some difficulty

Personal note

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Tips in preparing figures

- Make them **self-explanatory**
  - People do not need to read legends to understand
- Be informative and be pretty
- State findings in figure titles
- Explain everything in legends

- Learn from good journals
- Avoid use red & green

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Tips for writing result sections

- Each paragraph should have **ONLY one topic sentence**.
- Paragraphs should be **logically organized** around headings or sub-headings.

- Do not count words closely.

Discussion example: questions answered

WHY

WHAT

HOW

SO WHAT

As germplasms of major crops are maintained as genebank collections, understanding the population structure and phylogenetic relationships is of great importance for genebank management and utilization. In lettuce breeding, the GP1 species are used widely as there is no reproductive barrier within the group[6,7]. Our phylogenetic analyses clarified several issues regarding the taxonomic status of these GP1 species (see the Supplementary Note for a detailed discussion). First, the presumed GP1 species *L. georgica* should be reassigned as it clustered with the GP3 species *L. virosa*. The *L. dregeana* and *L. sagittata* samples are not to be considered as true wild species. Another GP1 species, *L. altaica*, has been considered as conspecific with *L. serriola*[29,30], but the plastid phylogeny implied an introgression and fixation of a distantly related plastid haplotype in *L. altaica*. Phylogenetic analyses with additional samples will clarify these taxonomic issues in wild species. Our study also pointed out future directions in germplasm collection and utilization. Among the investigated samples, *L. serriola* from the Caucasus represents the most promising resource because the population from this area showed the highest nucleotide diversity. *L. aculeata* represents another potentially important gene pool, as its phylogenetic position distinct from other GP1 species suggests a different genetic repertoire. Thus, our study provided new insights regarding accession identity and genetic resources for crop improvement, demonstrating the value of whole-genome sequencing in the management of crop collections and the utilization thereof.

Personal note

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Write Introduction

- Background information
  - Describe **the importance** of your area of study
  - Review the major findings in the field
  - Introduce **the related concepts/pathways/genes**
- Scientific question(s)
  - Raise the question **in a logical way**
  - Stress **its significance**
- Your findings
  - Communicate the major discovery

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Introduction: background

- The space is limited, normally 1-3 paragraphs.
  - Use only materials present in the literature
  - Use only materials directly related to your work

- Keep writing
  - Use your background knowledge
  - Do not overthink on details
  - Add (ref/cite) for important information and prepare a reference file

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Write a Title

- It should emphasize information on the MAIN concept/discovery you want to tell readers.
  - What was DONE
  - What was FOUND

- It is not easy to find a precise title, but you should have after the manuscript is drafted.

The editing phase

- **TOP-DOWN** editing
- Read through the draft multiple times
- Do not try to fix everything once; fix on one thing/error at a time (tense, details, typo, etc.)

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The editing phase (continued)

- Edit structure section by section
  - Move sentences/paragraphs to where they belong
  - Focus on the logic in each section
- Edit paragraph line by line
  - Look into each sentence, word, phrase, etc.
  - Language skills play an important role
  - Do it several rounds
- Seek for professional feedbacks after you have done a thorough editing
- Final check in spelling, grammar, numbers, figures & tables, etc.

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Outcomes from the editing phase

- **Clear key questions**
- The main Figures and Results **in the same topic**
- An updated Discussion and Introduction **after a thorough review of literature**
- A rewritten Abstract with **answers to the 4 questions**
- A precise and interesting Title
- Methods, supplementary materials, data deposition, etc.

Tips for English writing

- That (referring to a specific thing) vs which (adding a clause)
- Correct/incorrect, not right/wrong
- Only use “significant” for statistics
- Give exact/approximate numbers instead of several, most, a few, etc.

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Tips for English writing (continued)

- Articles: a, an or the
- Tense: past tense for results; present for facts; present tense in figure legends and formula; present perfect tense for continuous work
- Could, may, might
- Demonstrate, indicate, suggest
- Use short sentences

- Check grammar!

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Revise Abstract

- Abstract is the essence of your manuscript
  - It is **the FIRST thing** readers see, and sometimes the ONLY thing
  - It **sets the stage** by telling what your work is about
  - It is **critical for the reviewing process**

- It should be one paragraph about,
  - Why you did the work
  - What you found
  - Why it matters

Part II
Submission & revision

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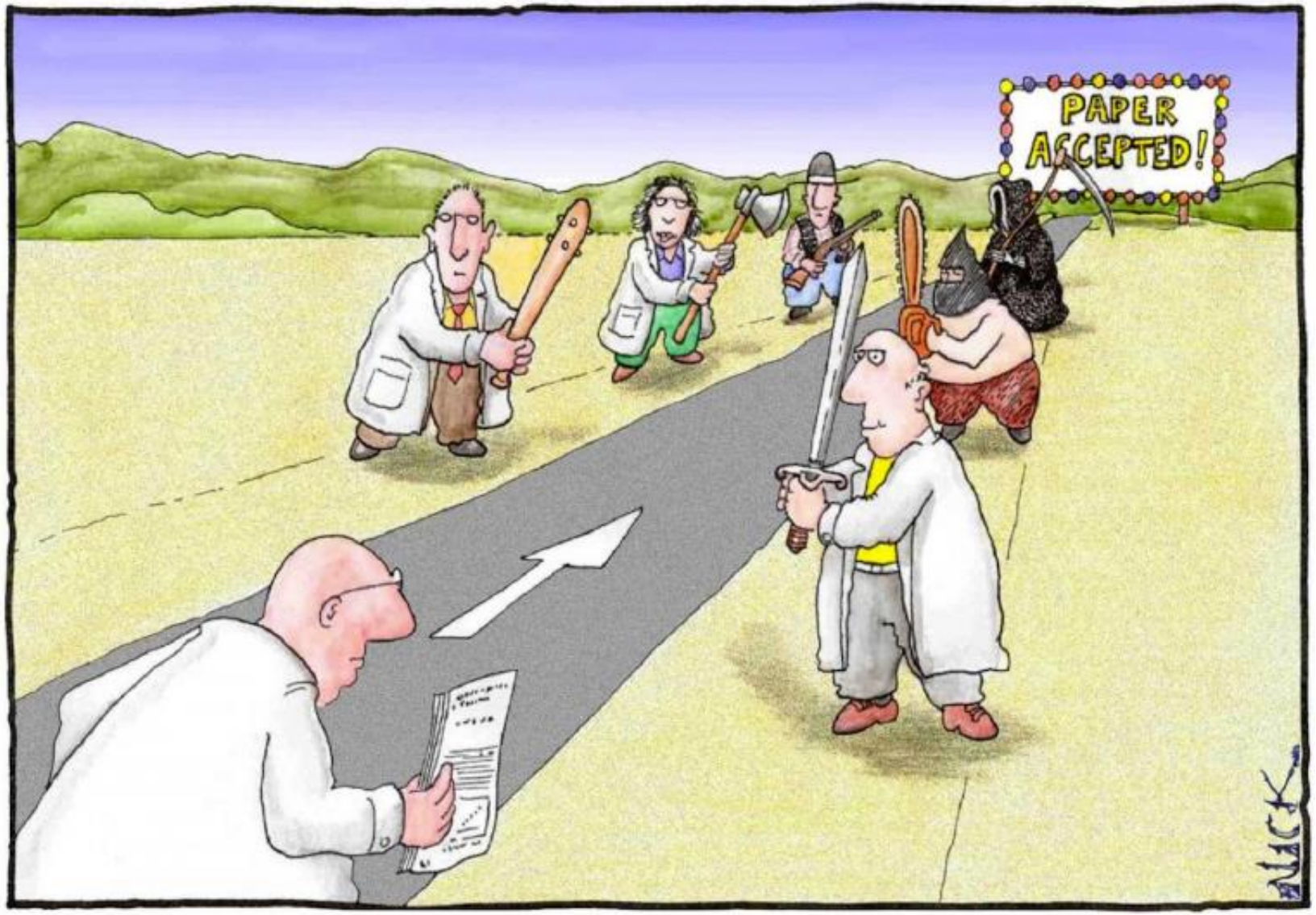
Ready to submit your manuscript!



Signal for submission

There is **no end of editing**, but there should be **a deadline for submission**!

- Everyone is satisfied (seldom).
- Major authors are satisfied (sometimes).
- Major authors are tired (most of the time).

- My advice
  - All the **major issues** raised by professionals are solved.
  - The logic is **easy to follow**.
  - The main text **reads well**.
  - There will not be any significant improvement in the next 2 months.

Paper submission

- Before pushing the SUBMIT button
  - Choose a **reasonable** journal
  - Write a **thoughtful Cover Letter**
  - Reformat according to the guideline

- Major or minor (unlikely) revisions
- Conditional acceptance -> copyediting -> formal acceptance

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Choose a target journal

- Impact Factor
  - It shows how many times **on average** papers in one year have been cited **over the next two years**
  - The top journal is not always a good choice
- The potential readers
  - Make a list of journals with narrow to broad readership
- Open access
  - More read and cited
  - Required by funding agencies

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Choose a target journal (continued)

- Time to publication
  - Competition
  - Graduation
  - Annual report
  - etc.

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Things to do for a particular journal

- **A thoughtful cover letter**
  - to communicate with editor
- A well-written abstract
  - Answer the WHY, HOW, WHAT, and SO WHAT questions
- The checklist
  - Follow the author guideline

Cover letter

- Cover letter is for editors, who decide whether to send out your manuscript for reviewing.
- Do **NOT** copy Abstract. **ALWAYS** write a good letter!
  - One page
  - Start with a small paragraph about the paper you are submitting
  - Explain why it is **important and interesting**
  - Describe what you have concluded
  - Describe how it **fits into the scope**

Bad examples

Dear editor,

Herewith we submit our manuscript entitled "The Genome Sequence of the Domestic Cucumber (Cucumis sativus var. sativus L.)" to Science. The manuscript includes the text, one tables, three figures, and supplementary material.

With our best regards,

Corresponding authors

Dear editor,

Herewith we submit our manuscript entitled "The Genome Sequence of the Domestic Cucumber (Cucumis sativus var. sativus L.)" to Science. The manuscript includes the text, one tables, three figures, and supplementary material.

Cucumber as good family is one of the most economically important botanical families. Collectively called as cucurbits, the family includes many important species as cucumber, melon, watermelon, pumpkin and squash. They provide vegetables, fruits, and edible seeds that appear most frequently in our daily diet.

Cucurbits are also model species for important biological processes. The family display a diverse variety of sex, from monoecy, andromonoecy to dioecy. Sex determination in cucurbits are controlled by single genes, similar to the situation in maize. The diverse types of the phloem, the equivalent of the animal arterial system, delivers nutrients and signaling molecules to developing organs. In contrast to the animal blood circuit, sampling of the phloem translocation stream is limited to a few plant species, including cucumber and pumpkin. Major discovery of the biosynthesis of the phytohormone phloridzin acid was achieved by using pumpkin as material.

Compared to their economic and biological importance, cucurbits are very much under-investigated. Taxonomic and genetic resources are modest. Genetic improvement of cucumber is further constrained since it is cross-incompatible with other species in the

ng. One feature about the cucurbit genomes is, although different, they have a similar genome size. This indicates on of genus and one genome should tell story of many formed an international consortium to sequence the ecies includes four Chinese institutes, three in US ada and one in Australia.

cucumber genome by a novel combinational method of the d next-generation Illumina GA sequencing technologies. the 350Mb genome and ~99% of the genic regions. The abundance of satellite sequences and rDNA. Cucumber 6,882) to Arabidopsis, but no recent whole-genome wer tandem gene duplicates was detected among the five genome sequenced. Nevertheless, tandem duplication genes related to cucumber biology, such as massive biosynthesis of secondary metabolites that give cucumber and bitter taste, and cell wall modifications associated with ha studies and watermelon genetic maps to the cucumber of the 7 cucumber chromosomes were result of fusion of spectacular with melon. As predicted, most cucumber and ly ordered on the chromosomes with 95% sequence

whereas in inter-genic regions the similarity is low due independent insertions elements.

cucumber genome will greatly advance our understanding of cucurbit biology ide unprecedented resource for their genetic improvement. Its projected e was demonstrated in a meeting held in Nov. 2008 in Shenzhen, China. The genomics workshop attracted about 100 researchers from 7 countries. Eight of vegetable seed companies also sent their representatives. Several international ive projects are being developed based on the genome, such as the China-Netherlands Initiative, the Sino-Dutch Cucumber Gene Expression Project, and genetic 100 Cucumber Genome Project.

cucumber genome was affordable in as only when next-generation sequencing ies came to stage. Its genomics is the 'equalizer', eliminating or narrowing the ers model cucumbers and orphan species. This research signals the arrival of ary changes in genetic improvement of orphan crops, which is still a critical sustainable development of the most disadvantaged regions in the world.

best regards,

ding authors

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Manuscript formatting

- Format the manuscript according to the guideline
  - Word count (make each section close to the requirements)
  - Text formatting (title page, subtitles, spacing)
  - Figure formatting (citation, width, etc)
  - Supplementary materials

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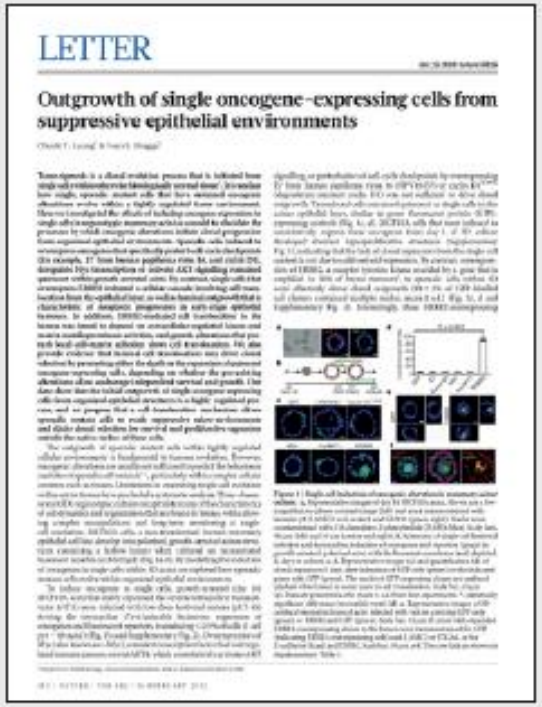
Author guideline

PRINT PAPER


LETTER

Outgrowth of single oncogene–expressing cells from suppressive epithelial environments

Key features:

- Includes main text and figures/tables/boxes plus references.
- Appears in print and online as a PDF and as full-text HTML.
- Text and figures are copy-edited to *Nature* style.
- Figure formats: colour artwork supplied in **RGB (recommended) or CMYK formats**; preferred formats are layered Photoshop (PSD) or TIFF for photographic images (minimum 300 p.p.i.), AI, Postscript, Vector EPS or PDF for line drawings and graphs.

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Author guideline (continued)

Formatting details in text

Order of elements

Articles should be ordered in the sequence: title, authors, affiliations (plus present addresses), bold first paragraph, main text, references, tables, figure legends, (online-only) Methods (plus any associated references; data and code availability statements included at end of online Methods), acknowledgements, author contributions, competing interest declaration, additional information (containing supplementary information line (if any) and corresponding author line), Extended Data figure legends and Extended Data table titles and footnotes (any references unique to the Extended Data should be added to the end of the online-only reference list).

Fonts

We prefer the use throughout of a 'standard' font, preferably 12-point Times New Roman. For superscripts or subscripts, please apply actual super/subscript format; do not use 'raised' or 'lowered' formats. For mathematical symbols, Greek letters, and other special characters, use 'insert', 'symbol' and then select '(normal text)' or 'symbol' as the font. Use of other fonts can cause translation problems. List non-standard keyboard symbols in the letter accompanying the final accepted version of your paper.

Author guideline (continued)

Final print-only artwork

When preparing figures, authors are advised to refer to printed copies of Nature to get a sense of general size and style points. For an illustrated guide to preparing production-quality artwork after acceptance, see this information document.

Lettering

Lettering should be in a sans-serif typeface, preferably Helvetica or Arial, the same font throughout all figures in the paper. Units, capitalization, etc. should follow **Nature** style. Where practical, avoid placing lettering directly over images or shaded areas.

Separate panels in multi-part figures should each be labelled with 8 pt bold, upright (not italic) a, b, c. Maximum text size for all other text should be 7 pt; minimum text size should be 5 pt. Amino-acid sequences should be presented in one-letter code in Courier.

Do not rasterize or covert text to outlines.

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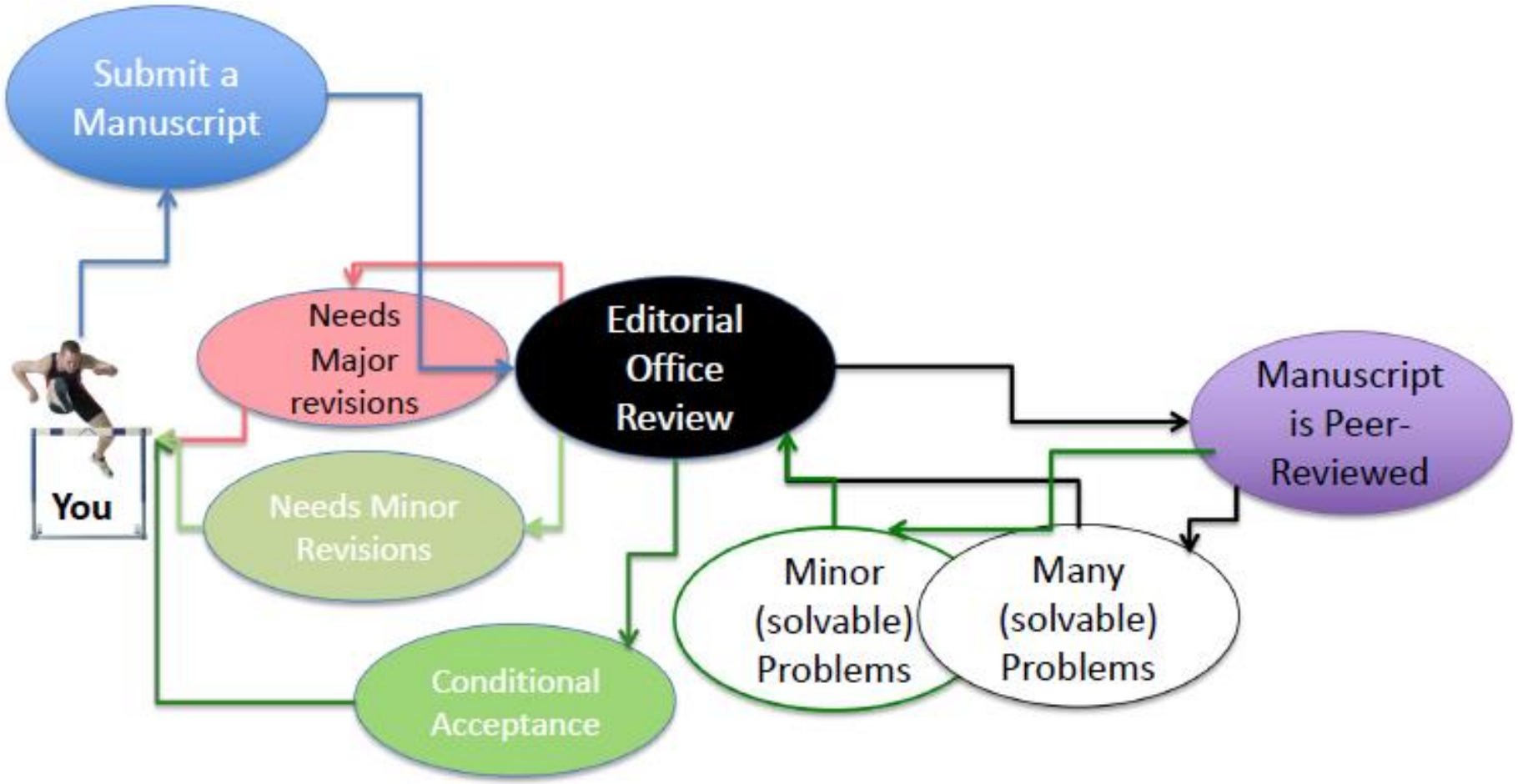
Theoretical reviewing process



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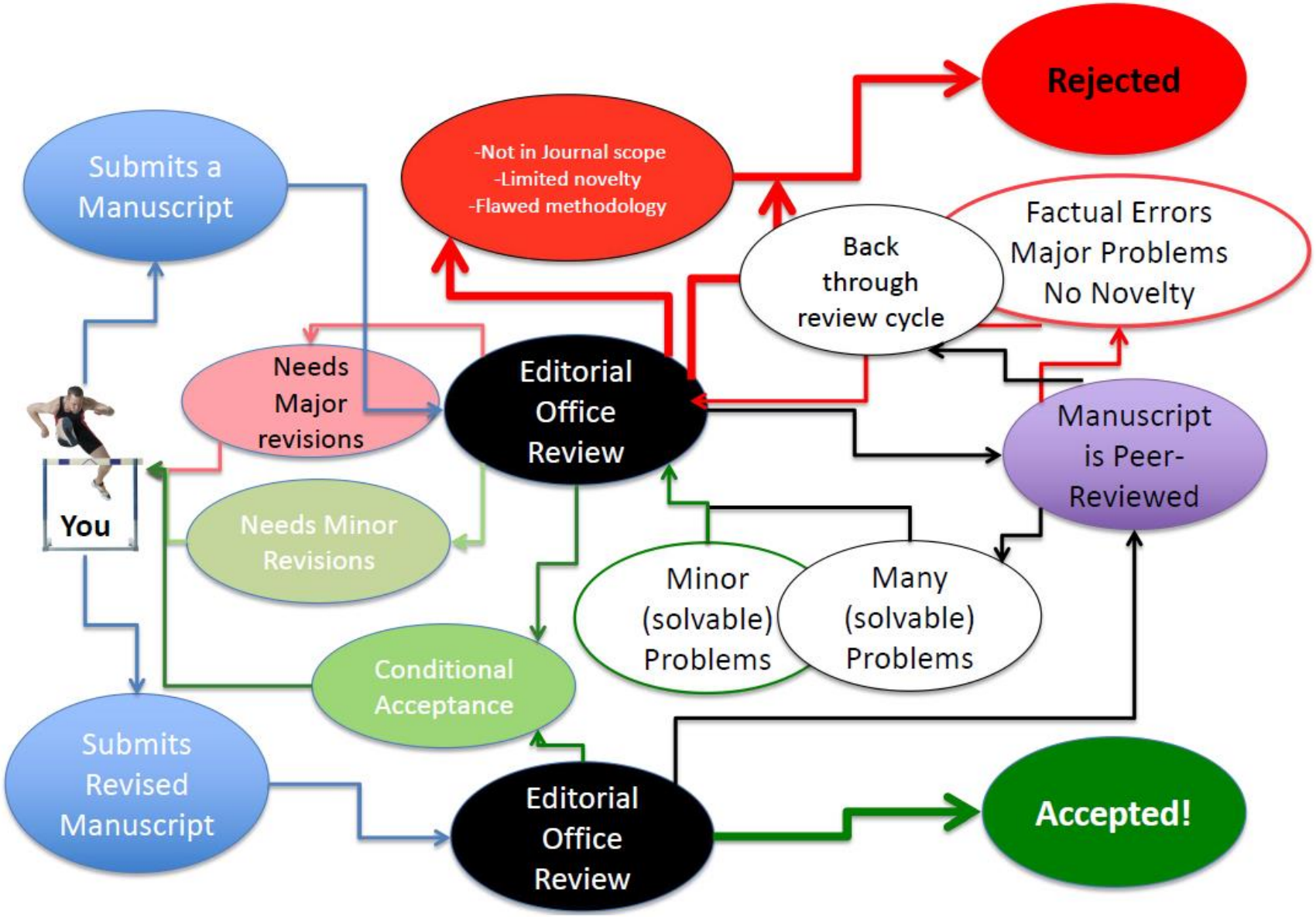
Actual reviewing process



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Common reasons for rejections

- No novelty
- Data do not support conclusions
- Not significant enough for your target journal

- Inappropriate experimental setup
- Inappropriate methods for the analysis

- Plagiarism
- Lack of ethical approval or missing data

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Negative comments from reviewers

- Novelty
  - “There is very little biological novelty”
  - “The work is unlikely to have broad interest”
- Scientific questions
  - “Paper is mostly descriptive”
- English writing
  - “The English is difficult to follow”
  - “The methods are uninterpretable”

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Response to reviewers

- Make a plan on,
  - What experiments/analyses to be done
  - What mistakes/typos need to be corrected
  - Which parts need to be re-written
  - Which comments need to be argued
- Focus on **the major issues**
- Fix the minor ones
- Highlight the changes in MS and indicate the line numbers in Response

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Tips for response to reviewers

- Thumb of rules
  - **Respond politely**
  - Do NOT argue; take it easy
  - Response to EVERY issue
  - Provide new evidence if you did what the reviewers asked
  - Explain clearly the reason if you decide not to do

- It is difficult to argue with No Novelty
  - Highlight the novelty in the first submission
  - Point out the novelty if reviewers miss it

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Conditional acceptance

- Fill out required forms, author consent letter, checklist, statements, etc.
- Meet the requirements for final submission, word count, figure size, acknowledgements, etc.
- **Data and code availability**

- There is another round of copyediting.

Questions?

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