

All-in-one guide for preparing and publishing a bioscience manuscript

Pooja Negi and Ashish K. Srivastava*

Research articles communicate original scientific research to their target audience, shaping individual careers and ultimately, scientific paradigms themselves. Writing a high-quality manuscript requires substantial investment of time and effort, but without careful optimization, success of the final product is far from being assured. To address this, we used a meta-survey approach to identify the key determinants of a positive editorial reception. Interestingly, scientific writing and overall manuscript quality emerged as the major determinants of editorial response, irrespective of the journal background. However, writing a high-quality manuscript is often a challenging task for seasoned researchers; for a novice it might prove to be overwhelming. In recognition of this, the present article aims to streamline the manuscript development process for seamless conversion of novel experimental findings into a well-written paper. To this end, we have deconstructed the scientific writing process into seven salient steps, starting from conceptualization to final post-publication networking.

Keywords: Appeals, bioscience manuscript, peer review, rebuttal, revision, scientific communication.

‘Stand on the shoulders of giants’

AFFIXED on the Google Scholar page, this metaphor was interpreted by Newton as ‘Using the understanding gained by major thinkers who have gone before in order to make intellectual progress’. Scientific research is made of intellectual building blocks, where each one derives from the previous link and establishes the ground for the next one. Enormous technological advancement in the last 20 years has allowed us to ask and address large-scale questions in biology. As a consequence, a huge number of articles are submitted to peer-reviewed journals every year. The onus on authors to submit a well-written manuscript that presents novel high-impact findings is now more than ever before. However, developing a quality manuscript can be difficult for established authors and even harder for those attempting this herculean task for the first time. In this article, we have employed a meta-analysis approach to critically evaluate the most important criteria for manuscript rejection. To address these issues, we have proposed a step-wise guide for preparing and communicating manuscripts and handling reviewers concerns. We have also provided a list of tools and databases which authors can utilize to further enhance the quality of their manuscripts.

Authors are in the Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai 400 085, India and Homi Bhabha National Institute, Mumbai 400 094, India

*For correspondence. (e-mail: ashishbarc@gmail.com)

What constitutes a good article

Journal editors evaluate all submitted manuscripts, forward those meeting editorial standards for peer review, and consider reviewers’ suggestions to make a final decision. To get accepted, a manuscript must satisfy the editor of its novelty, significance and impact; the reviewers must be convinced of its scientific rigour and technical soundness¹. However, unless the data are systematically organized to convey the main idea, all that novelty is of no use. Before going into the finer details of manuscript preparation, let us establish what experts consider a good manuscript^{1,2} (<https://tomprof.stanford.edu/posting/1566>).

The question

A good manuscript should have novelty, be rooted in a strong theoretical background and well conceptualized to address an important biological question.

The approach

Authors should employ an incisive approach powered by well-designed experiments with adequate controls, statistically strong analysis and insightful interpretation.

The impact

The manuscript should clearly demonstrate how the findings are novel and robust. It should integrate with other

studies to emphasize the impact on the general understanding of the biological question and how it establishes the ground for future studies.

The structure

A good manuscript is structured to focus on one central idea and its backbone is built upon answering the following three questions: (i) Why the author did something? (Biological question, stated in the Abstract). How did he/she approach it? (Described in Methods). (iii) What are the findings and what do they imply? (summarized in Results and inferred in Discussion).

The visuals

Well-designed, high-quality figures which support the conclusions and voice the author's arguments are the centrepiece of a good manuscript.

Strength of writing

A good manuscript is written to project one fundamental message. On component level, the Introduction is tailored to the author's arguments. Discussion is well-inferred and juxtaposed in a global context to establish novelty and significance. Similarly, Conclusions are data-driven with minimum speculation, the latter included only for directing future studies.

The language

While scientific writing prizes factual and technical language, a good manuscript must tell a compelling story as well, for which creative writing is essential. A good manuscript balances these two elements, being concise and informative without being dry.

To critically ascertain the relative significance of the above-mentioned factors for manuscript acceptance/rejection, we conducted a meta-survey with various journals of the animal, plant and microbial sciences backgrounds. These factors were consolidated into six discrete criteria and for quantitative assessment, we ranked the significance of these factors from 1 (trivial) to 10 (critical; [Supplementary Table 1](#)). As expected, the meta-survey indicated 'Novelty of scientific idea and its fundamental or practical significance' to be the most important determinant of manuscript acceptance, followed by the 'Critical analysis and accurate interpretation of experimental findings' (Figure 1). Interestingly, 'Well-defined manuscript structure and quality of scientific writing' unanimously emerged as the next most important determinant of positive editorial reception. In view of this, the present article guides young authors towards the successful con-

version of important and critically analysed research findings into a quality manuscript.

Preparing the manuscript

This section delves into the step-by-step preparation of a scientific paper. Authors can follow this directional sequence for mapping and developing their manuscripts from conceptualization to final submission (Figure 2).

Establish the right mindset

A research article should convey meaningful scientific information in an engaging manner. Thus, it requires a combination of skills, which includes mindful writing, logical argumentation, seamless structuring, good command of scientific language and, most importantly, patience. Before the drafting commences, authors need to answer two key questions crucial for successful acceptance (Figure 3). The first question that the authors must ask themselves is 'so what?' It is necessary to establish the significance of the biological question being asked in your work, to validate the investment of time and resources. Given the large number of submissions every year, journals have become extremely picky about what gets published. Thus any study which fails to significantly advance existing knowledge will be rejected right away. For instance, *Nature* reported an 8% acceptance rate in 2017 (<https://www.nature.com/nature/for-authors/editorial-criteria-and-processes>). The second question pertains to the selection of the right journal for your work. Addressing these two questions will help the authors to

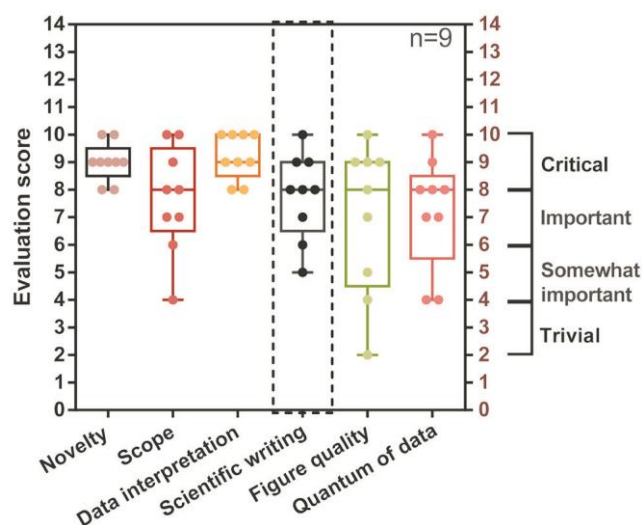


Figure 1. Key determinants of manuscript acceptance. Six factors routinely implicated in determining editorial reception were rated from 1 to 10, with 1 being the least important and 10 being the most important for acceptance. Based on the editorial outputs from different journals, these factors were organized into four discrete categories: trivial (2–4), somewhat important (4–6), important (6–8) and critical (8–10).

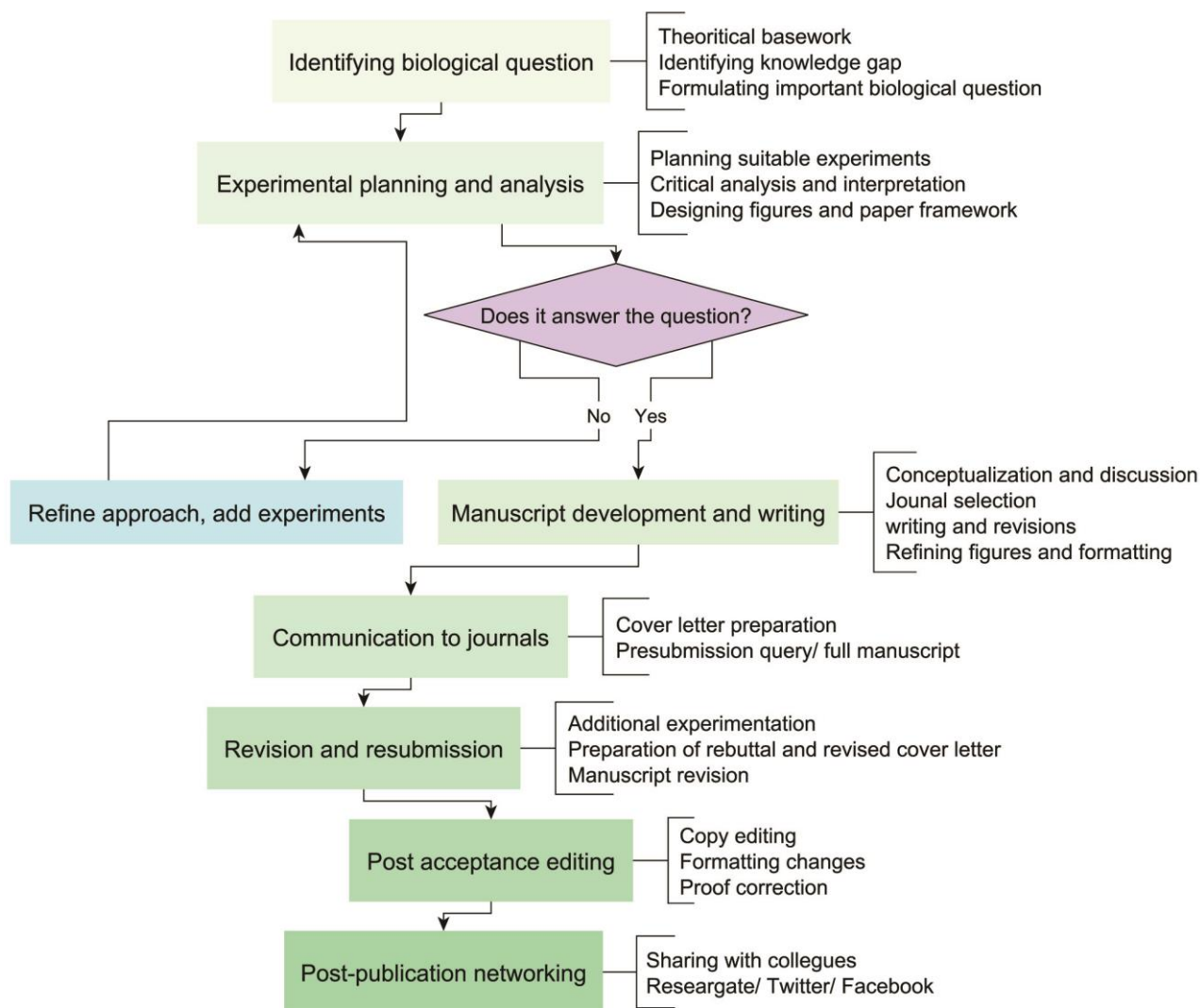


Figure 2. Seven steps to scientific writing. The scientific writing process consists of seven salient steps, beginning from the conceptualization of a novel scientific idea to main writing and communication, finally culminating in its post-publication dissemination. Each step consists of several sub-steps and may require continuous refinement throughout the writing process.

start drafting the manuscript in the right mindset. Recalling these answers will also restore their focus in times of digression (which would be often) and mould the manuscript to suit the target journal. Finally, writing a quality manuscript takes several rounds of revision and the first draft is bound to be crude. Thus, it is essential to write the first draft at the earliest and circulate it among the co-authors so that the process of refinement can begin.

Gather/arrange your data

The first step while writing a paper consists of converting all the raw data into finished images and editable worksheets. In the later stages of manuscript preparation, authors’ perspective and, accordingly, the shape of the paper change repeatedly. Thus, it is essential to keep

meticulous records of raw data for easier conversion into finished form, as well as quick access for all future modifications.

Generate figure(s) and tables

Figures and tables are a visual medium to represent complex data, making it easier for the readers to understand and infer. These are the cornerstones of a manuscript, and many readers focus only on the figures while browsing through papers and skip the text altogether. Well-designed, high-quality graphical components lend a degree of professional credence to one’s work and enhance its appeal to the readers. A large number of tools, both free and subscription-based, can be utilized to develop quality figures (Table 1). Ideally, the data should be plotted at

the end of the experiments itself so that successive experiments can be better designed to thoroughly address their biological question (Figure 2). Once the figures and tables are ready, the authors can realistically compare their findings to the original biological question to draft a rough structural framework of their manuscript.

Representation of data as a table or figure is determined by the type of data being presented and the context in the manuscript.

Tables are useful for summarizing large datasets, e.g. field-based agronomic data. They must be well-designed, clearly legible and contain all the relevant information (legends, units).

Figures can be used for presenting a diverse set of visual elements, including the following:

(i) Schematics: These can be used to depict a process or pathway, e.g. experimental design or analysis pipeline. They should contain text in addition to that in the manuscript and must be used to highlight specific parts.

(ii) Images: They are an effective medium for communicating descriptive information precisely. Gel photographs or visual phenotype can swiftly reveal differential responses between contrasting genotypes under test conditions.

(iii) Data plots: These are versatile tools which allow complex information and large amounts of data to be visualized as logical trends and functional/statistical relationship between two or more categories/individuals/populations/items. In general, basic data plots (e.g. bar graphs) compare means between experimental sets adjusted by the respective standard error/standard deviation.

While panelling, authors should critically evaluate whether the sequence of illustrations in each figure unambiguously supports the story flow. Modern biology is quantitation-driven; so wherever appropriate, graphical illustrations should be complemented by quantitative plots (Figure 3). Moreover, authors should ensure that their images (e.g. microscopic, taken in RGB) are compatible with printing standards (CMYK). Most journals require the figures to be prepared according to colour blind-friendly practices (<https://jfly.uni-koeln.de/color/>). Graphics software such as GIMP can be used to edit any already existing figures that are incompatible with these guidelines. Figures must be clean (systematic and in sync with the text), non-repetitive, high resolution (sharp at 300%) and properly scaled (extremely important). Within a figure, individual panels should be clearly labelled according to their sequence in the main text. The in-figure labels and symbols should be clear, legible and uniformly sized. It is better to use bold fonts like Arial or Times New Roman with uniform lettering. While some degree of processing is inevitable and indeed necessary, authors must refrain from biased image manipulation to improve their results. Routine processing, such as brightness/contrast adjustment should be consistent across all

images. Any form of editing, e.g. cropping, should accentuate the clarity and presentation of final figures without adding or deleting any details. Wherever appropriate, the *P* values/significance levels must be indicated so that readers can judge the data and derive their own conclusions. Since journal selection usually succeeds figure preparation, authors should keep all original files intact while making necessary adjustments to meet the dimensional requirements of the target journal. For further details on data visualization, see O'Donoghue *et al.*³.

Authors must ensure that each figure is 'stand-alone' and self-explanatory, irrespective of the main text. Hence legends must be concise and contain all key information, such as sample number and abbreviations. Colour figures should be prepared for printing only if necessary, for deriving meaningful information. Accessory tables and figures, which are not essential for deriving the major conclusions, should be given as supplementary information.

Things to avoid: (i) Biased image manipulation; (ii) Obscure legends and symbols; illegible font size; (iii) Crowding and lack of theme; (iv) Improper scaling and (v) Poor resolution.

Selecting the right journal

Once the figures are ready, authors can get a fair idea about the projection of their paper. This, in turn, can guide the selection of prospective journals for the manuscript. Submission to an incompatible journal is one of the major reasons behind outright rejection, with precious time being lost during redrafting and communication. Thus, it is imperative to make a judicious selection of target journals based on the following points (Figure 3; <https://www.springeropen.com/get-published/find-the-right-journal>).

Matching the scope and audience of the target journal: Some studies explore a big question in some depth, while others are prospective in nature. Similarly, certain manuscripts are rooted in niche research areas, while others have broad implications with a wider readership. Thus, choosing the right journal, whose scope and audience matches the scientific premise and impact of the study is essential for acceptance.

Reputation and impact of the paper: Any over- and under-evaluation of one's work can result in immediate rejection or poor visibility post publication respectively. Thus, after broadly determining the impact of their article, the next step is to find a journal with comparable quality and visibility. The most common index used for this purpose is the journal impact factor (JIF), calculated as 'the average number of times articles from a journal published in the past two years have been cited' (<https://incites.help.clarivate.com/>). Though popular, impact factor (IF) is only applicable to journals fulfilling Clarivate

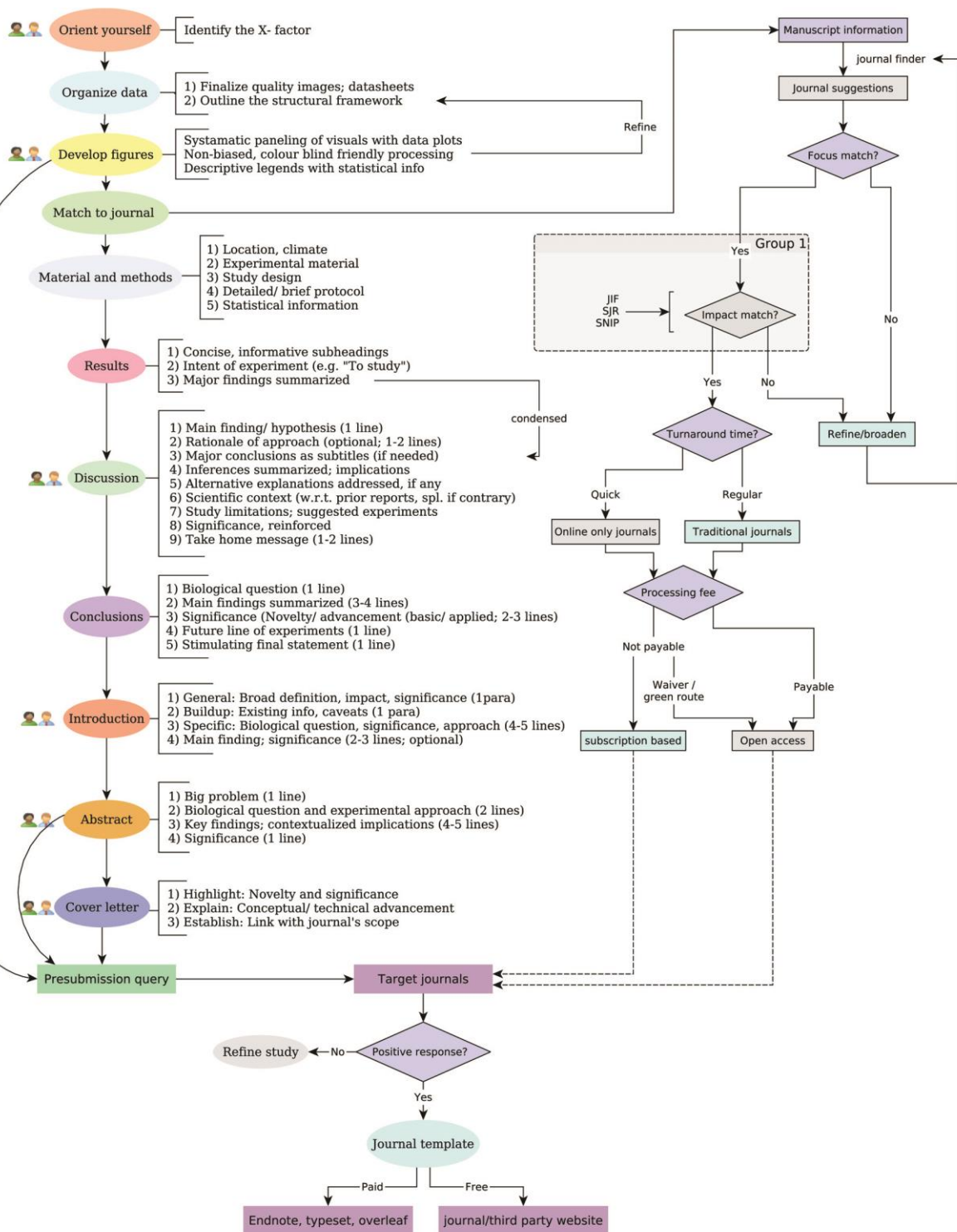


Figure 3. Microstructure framework of a ‘good’ research manuscript. The individual steps and sub-steps involved in the preparation of a manuscript are outlined in detail. Group 1 represents a key node of consideration as the authors can find suitable journals for their manuscripts using estimates such as Source Normalized Impact per Paper (SNIP), Journal Impact Factor (JIF) and Journal Citation Report (JCR). Authors can use this framework for mapping and formulating their papers, with modifications to suit specific disciplines and research fields.

Analytics’ standards. Moreover, there is no direct correlation between the IF of a journal and the actual outreach of a paper.

Author’s requirements: After shortlisting some journals, authors must carefully evaluate whether their publishing criteria match with their immediate requirements. For

instance, a journal with faster turnaround will be more suitable if one's needs to publish quickly; for instance, online-only journals. If one can afford to wait, a higher impact journal with slower publishing speed can be targeted.

Authors should carefully weigh these factors and discuss with their colleagues and superiors before making a final decision. It is a good idea to identify 3–4 journals at this point, so that in case of rejection, the manuscript can be quickly submitted to the next best journal. There are multiple journal finding tools which take in the authors' inputs to indicate suitable journals (Table 1).

Pre-submission enquiry

Before devoting considerable time and effort towards drafting the manuscript to fit the target journal, it is only sensible to gauge the prospective editor's interest. This is done through a pre-submission enquiry, a partial submission addressed to the editor which briefly summarizes the major findings of the paper, highlights its significance and emphasizes its suitability for publication in that journal (Figures 2 and 3). A pre-submission enquiry informs one as to whether his/her article has a good chance of editorial acceptance, thereby saving substantial amount of time and efforts in case of manuscript rejection. Moreover, time-sensitive research, e.g. drug or vaccine trials, requires rapid review to avoid obsolescence (<https://www.editage.com/insights/how-to-write-a-presubmission-inquiry>). Unlike manuscripts, a pre-submission query can be submitted to multiple journals in one's zone of consideration; the final manuscript can be prepared according to the journal with the most favourable response. A positive feedback indicates that the journal is anticipating the manuscript, giving the author an edge over other submissions. Thus, authors are advised to carry out pre-submission queries before the manuscript is completed. A typical pre-submission enquiry consists of the following components:

(i) The major findings of the paper, represented by 1–2 key high-quality figures. The purpose is to introduce the principal idea of the manuscript to the editor.

(ii) An abstract that underscores the key results, and their specific and broad implication. It should give the editor an overall idea of the work and help him/her decide if the research will be relevant to the journal's readers.

(iii) A cover letter which highlights the novelty and significance of the findings and explains how these contribute towards advancing the existing knowledge in the field. Finally, a connection must be established between one's work and the journal's scope.

Things to avoid:

(i) Vague/verbose content – Must be concise and only include the important details necessary for assessing the quality and suitability of one's work.

(ii) Superfluous content – Must be objective, professional, and avoid over-inflating the significance of one's findings.

Using journal templates

As mentioned before, preparing a manuscript fit for submission generally requires several rounds of revision and formatting. Instead of writing the entire manuscript and then adapting it to journal standards, authors can directly use pre-made journal templates. Nowadays many journals offer both MS Word and LaTeX formats to aid authors with submission (Table 1). Endnote is a multi-utility software equipped with predefined Word templates for a variety of journals. Among online paid options, typeset is an all-around writing service that offers both Word and LaTeX templates for 100,000+ journals, in addition to collaboration and quality check for plagiarism and grammar (<https://www.typeset.io/>). Similarly, overleaf is an online LaTeX-based collaborative writing and editing tool which hosts templates for most of the major publishers (<https://www.overleaf.com/>). Many journals under Elsevier (known as your paper, your way), ACS and recently Wiley, allow format-free submissions; only revised articles need to be formatted according to journal guidelines. However, this relaxation may not be applicable to all journals and authors must consult individual journal guidelines for detailed information.

Materials and methods

As any graduate student would swear, the Methodology section is the easiest part to write in a manuscript. This details the various protocols undertaken to address the biological question, for easy replication by fellow investigators (Figure 3). Starting from description of the experimental design, the section should be written in the same order as the story flow. For outdoor experiments, necessary information on climatic conditions or geographical location should be provided. Established protocols (along with any specific changes) should be mentioned briefly with suitable references, while new methods or protocols must be explained in detail for easy replication. Wherever required, authors should use standard systems for units and nomenclature, e.g. International System of Units (SI). To finish, authors should also describe the statistical methods used (including confidence levels, etc.).

Finally, since many authors describe previously published protocols, extent of word identity/plagiarism can be high in this section. Authors should check for the extent of plagiarism using software like Grammarly and Turnitin (Table 1). An active voice can be used instead of passive paraphrasing to keep it interesting for the reader.

Table 1. Essential tools and resources for scientific writing. Major software routinely required by authors during manuscript preparation have been listed, with both paid and free options. Freemium denotes the free availability of a basic version of the software and full functionality/additional features with paid subscription

Application	Software	Key function	Online/Offline	Operating systems	Usage	Reference/link
Statistical analysis and graphical visualization	Excel	For routine visualization of small datasets; XLSTAT allows data analysis, customization and sharing	Offline	W, M	Annual and perpetual subscription	http://microsoft.com/excel ; https://www.xlstat.com/en/
	graphpad Prism	Data visualization software with intuitive GUI and built-in statistical analysis	Offline	W, M	Annual subscription	https://www.graphpad.com
	SPSS	User-friendly analytical software suite for a variety of advanced statistical analysis	Offline	W, M	Monthly and perpetual subscription	https://www.ibm.com/in-en/analytics/spss-statistics-software
	SAS	Statistical programming language for advanced analytics and predictive analysis; suitable for large datasets	Offline	W, L, M	Annual subscription	https://www.sas.com/en_in/software/stat.html
	Origin	Suitable for statistical analysis and visualization of large data sets	Offline	W; M using virtual machines	Annual and perpetual subscription	https://www.originlab.com
	SciDAVis	Intuitive analysis and visualization alternative to origin	Offline	W, L/GNU, M	Free	http://scidavis.sourceforge.net/
	MATLAB	Multi-paradigm computing environment and proprietary programming language for mathematical operations, data analysis and visualization	Offline	W; compilers needed for M (Xcode) and L (GCC)	Annual and perpetual subscription	https://in.mathworks.com/products/matlab.html
	Octave with Gnuplot	Command-line driven software for interactive visualization of data and numerical computations	Offline	W, L, M, BSD	Free	https://www.gnu.org/software/octave/ , http://www.gnuplot.info/
	R with ggplot2	Comprehensive programming language and environment for statistical and graphical analysis with ggplot2 as declarative graphics utility	Offline	W, L, M	Free	https://cran.r-project.org/bin/windows/base/http://ggplot2.org
	Python with Matplotlib, numpy, scipy	MATLAB alternative for visualizations of datasets	Offline	W, L, M	Free	http://matplotlib.org
	Mathematica	Symbolic maths and graphical analysis of mathematical functions and data sets	Offline and online (cloud app)	W, U, M	Annual and perpetual subscription	https://www.wolfram.com/mathematica/
	Tableau	Easy to use interactive visualization tool for large datasets; allows use of R or Python scripts (cloud app)	Offline and online (cloud app)	W, M	Annual subscription	http://tableau.com
	Biopython	Python library for bioinformatics that handles sequence import, format interconversion, interaction with sequence alignment tools (e.g. BLAST)	Offline	W, L, M	Free	https://biopython.org/
	Plotly	Interactive data visualization tool, with Python and R libraries	Online (R and Python packages run Offline)	NA	Free	https://plot.ly/create/

(Contd)

Table 1. (Contd)

Application	Software	Key function	Online/Offline	Operating systems	Usage	Reference/link
Scientific illustrations	Adobe Illustrator	Professional vector graphics editor for both 2D and 3D illustrations	Offline	W, M	Monthly subscription	https://www.adobe.com/in/products/illustrator.html
	Inkscape	Open-source alternative to Illustrator that offers similar functionality	Offline	W, L, M	Free	https://inkscape.org/
	Biorender	Easy to use design software with premade icons for creating scientific illustrations	Online	NA	Freemium, monthly subscription	https://biorender.com/
	Photoshop	Popular raster graphics editor for data images	Offline	W, M; L using virtual machines	Monthly subscription	https://www.adobe.com/in/products/photoshop.html
	GIMP vmd	Free, open-source alternative to Photoshop	Offline	W, L, M	Free	https://www.gimp.org/about/
		Molecular graphics program to view and analyse the results of molecular dynamics simulations	Offline	L, M; W using OpenGL and CUDA	Free	https://www.ks.uiuc.edu/Research/vmd/
	Maya with mMaya	Animation suite for modelling, animation and simulations; the mMaya plug-in permits the import and manipulation of biomolecular structures	Offline	W, L, M	Monthly and annual subscription	https://www.autodesk.com/products/maya/overview ; https://clarafi.com/tools/
	BioBlender	Molecular structure add-on for Blender for interactive visualization and manipulation of proteins	Offline	W, L, M	Free	http://www.bioblender.org/
	chemdraw	Molecular editor for tailored visualization of chemical structures and reactions for metabolic pathways	Offline with web plug in	W, M; L using wine	Annual and perpetual subscription	https://www.perkinelmer.com/product/chemdraw-professional-chemdrawpro
	yED	Java-based general-purpose diagramming program good for schematics like flow charts	Offline with web plug in	W, L, M	Free	https://www.yworks.com/products/yed#
Journal finder	Scimago journal and country rankings	Journal search is based on multiple factors, including impact factor, subject area, subject category, open access and journal title	Online	NA	NA	https://www.scimagojr.com/journalrank.php
	Elsevier Journal Finder	Uses the manuscript title, abstract and area of research to suggest suitable Elsevier journal	Online	NA	NA	https://journalfinder.elsevier.com/
	Springer Journal Suggester	Uses the manuscript title, abstract and subject area to suggest a suitable Springer nature journal	Online	NA	NA	https://journalsuggester.springer.com/
	JANE – Journal/Author Name Estimator	Finds suitable journals based on title and/or abstract and/or keywords	Online	NA	NA	https://jane.biosemantics.org/
	JournalGuide	Searches for matching journals based on title, abstract or keywords	Online	NA	NA	https://www.journalguide.com/
	Wiley Journal Finder	Uses the manuscript title and abstract to suggest suitable Wiley journal	Online	NA	NA	https://journalfinder.wiley.com/search?type=match/

(Contd)

Table 1. (Contd)

Application	Software	Key function	Online/Offline	Operating systems	Usage	Reference/link
	Edanz Journal Selector	Journal search is based on keywords, field of study, journal name, publisher or manuscript abstract	Online	NA	NA	https://en-author-services.edanzgroup.com/journal-selector/
	Journal Suggester	Finds suitable Taylor and Francis journal using manuscript abstract	Online	NA	NA	https://authorservices.taylorandfrancis.com/journal-suggester/
	Endnote manuscript matcher	Endnote built in utility that finds suitable journals using manuscript title, abstract and references	Offline	W, M; L using wine	Perpetual subscription	https://endnote.com/
Writing environments/journal templates	Endnote	Writing environment that combines template-based writing, reference organization with automatic updates and ease of coordination	Offline	W, M; L using wine	Perpetual subscription	https://endnote.com/
	Overleaf	On-line collaborative writing and publishing tool with built-in LaTeX editor, real-time view and automatic preview of output	Online	NA	Freemium, monthly subscription	https://www.overleaf.com/
	Typeset	Writing and collaboration platform which offers word-based templates with reference organization, proofreading and submission-ready LaTeX/pdf output	Online	NA	Freemium, annual subscription	https://typeset.io/
Grammar and plagiarism check	Grammarly	General-purpose tool for correcting grammar, plagiarism and improving text quality and composition; supports multiple languages	Offline with web plug in	W, M	Freemium, monthly, quarterly and annual subscription	https://www.grammarly.com/
	Ginger	Basic grammar and proofreading tool; supports only English	Offline with web plug in	W, M using safari or chrome	Freemium, monthly and annual subscription	https://www.gingersoftware.com/
	Turnitin	Proprietary software that checks for citation mistakes or plagiarism	Offline	W, M, chrome OS, El Capitan	Monthly and annual subscription	https://www.turnitin.com/
Bibliography	Zotero	Reference management software tool that automatically extracts and organizes references for multi-style bibliography	Offline with web plug in	W, L, M	Free	
	Mendeley	Citation and collaboration manager that generates bibliographies in word, LibreOffice and LaTeX	Offline with web plug in	W, L, M	Free	https://www.mendeley.com/?interaction_required=true
	RefWorks	Web-based reference management tool to generate and format bibliographies and manuscripts in multiple output styles	On-line with MS word plug in	NA	Annual subscription	https://www.refworks.com/refworks2/
	Citationsy	Reference management software tool that automatically extracts citations; can be used as a mobile app	Offline with web plug in	W, L, M	Freemium, annual subscription	https://citationsy.com/
	EndNote	Collaborative reference manager with an extensive number of reference styles that also cites conference papers, press release, etc.	Offline	W, M; L using wine	Perpetual subscription	https://endnote.com/

W, Windows; L, Linux; M, MacOS; BSD, Berkeley Software Distribution; NA, Not applicable.

Things to avoid: (i) Inadequate information about novel methodology; (ii) Discrepancy regarding units and nomenclature; (iii) Protracted detail about routine protocols.

Results: summarize it all

The results section is basically an ordered summary of the representative findings which are essential for drawing inferences. It is generally written in the same sequence as figures and methodology, and supports the flow of the story. First, the author must explain the rationale behind experimental design, statistical analysis or population used for deriving the data. Since it is a data-centric section, the text should be number heavy, e.g. fold change values for various parameters. In addition, information from appropriate statistical tests should be included with relevant parameters (Figure 3). For better comprehension, concise subheadings should be used. While one should avoid adding inferences in this section, a summary line which summarizes the entire information can tie it together.

Things to avoid: (i) Qualitative descriptions; (ii) Cramming all data and (iii) References.

Discussion: explain, infer, relate

If figures are the face of one's paper, then discussion is the backbone. It is one of the most challenging parts of any paper and frequently the most revised as well. Weak discussion is a leading cause of manuscript rejection; so authors must strengthen this section. The Discussion can either begin with a brief restatement of the hypothesis/rationale for context or go straight to the point with the interpretation of results (Figure 3). Entirely new ideas must not be introduced here without prior mention in the Introduction. A good working strategy would be to identify the key points from results, rework them into concise subheadings and expand them further to build up discussion. Authors must point out the novel findings of their paper without resorting to exaggeration and superfluous language. If needed, significance can be highlighted using quantitative terms, so that readers can judge for themselves.

Discussion is not a reiteration of results, but their inference and how they compare with existing literature or the initial hypothesis proposed in the Introduction (Figure 3). So, while it is good to cite published studies that support one's results, contrasting reports should also be cited. Authors should explain why their results are correct despite these studies, for a balanced perspective. Research is an ongoing exercise and each article covers a certain aspect of biological question. Therefore, authors should also address any limitations or discrepancies of their study and their effect on the validity of their inferences; these shortcomings should be justified with the help of key references. This lends professional credence and

scientific rigour to one's work, and creates a favourable impression on the reviewers. Citing multiple references to support a single argument does not proportionately increase its validity; so one must only include the most essential references. Since each study has its own caveats, authors can suggest future experiments to address such gaps, albeit briefly. While it is okay to speculate on the broader implications of one's work, they must be concise and sufficiently supported by the data. The final sentence must be especially well composed for a positive impact.

Things to avoid: (i) Repetition of results; (ii) Over-inflation of results to project novelty; (iii) Superfluous language and strong adjectives; (iv) Sudden introduction of new ideas; (v) Too much speculation on possible interpretations and (vi) Too many/too old/cherry-picked references.

Conclusion

This is the take-home message from one's study. This section indicates the significance of the key findings and their contribution towards advancing knowledge in the field of study. Thus, it highlights the impact of one's study as well as calls for future research. A concise Conclusion section is essential for acceptance by reviewers and readers alike.

To write the conclusion, one must start with the main inferences from the study. This can be followed by the how the results contribute to the global understanding of the biological question (Figure 3). The conclusion is not a detailed summary of results or repetition of abstract; rather, it connects the outcomes of one's study with the proposed objective and highlights their scientific relevance, be it basic or applied. As mentioned before, any major caveats and further experiments to address these should also be indicated. For a lasting impression, the conclusion must end on a positive, stimulating note.

Things to avoid: (i) Repetition of abstract/discussion; (ii) Obscure/vague statements about the impact of one's study; (iii) Biased perspective of the strengths of the experimental approach and (iv) Superfluous language.

Introduction: first impression matters

After writing the conclusion, one can write about how it all began, i.e. the Introduction. The importance of a good introduction cannot be overstated. A well-written introduction is crucial for establishing a clear dialogue with the relevant audience, be it the editor or future readers, and inform them why the study needed to be conducted. Introduction is not a passive summary of previous work; rather it is a focused and directional element specific to one's work. Generally speaking, introduction flows in a general (e.g. broad issue) to specific (specific objective) direction. It reveals the existing research scenario and

states one's objectives in the informational context. By doing so, it sets up the theme of the paper.

To write a compelling introduction, the first step is to chalk out a general framework of information flow, such as content of each paragraph (Figure 3). The next step is to gather the relevant literature pertaining to one's subject area, with a focus on recent original papers and key reviews (preferably within the last three years), which offer mechanistic information and/or succinctly present the existing knowledge. A practical suggestion is to build the bibliography with information which is necessary for understanding the work. Authors need to distill this information to establish the background and reveal the knowledge gaps being addressed by their paper. Hypothesis and objectives can be stated towards the end of introduction. Finally, the introduction must be concise and written in good English, with simple sentences preferably devoid of unnecessary adjectives.

Things to avoid: (i) Excess word count; (ii) Vague and run-through sentences; (iii) Unnecessary, protracted or scattered information and (iv) Too many references.

Abstract: a concise sketch of the manuscript

Abstract is a structured narrative which distills the essence of a paper and informs readers of the key findings in a study. As mentioned before, the abstract plays a deciding role in the eventual acceptance of a manuscript. Typically, an abstract should briefly introduce the field of study and state the biological question (preferably within the first two sentences; Figure 3). This can be followed by the major experimental approach used to address the defined problem, along with any novel/important methods used. Finally, it should state the key results ending with the major conclusions and if appropriate, the broader implications of one's findings. As mentioned before, the abstract is the most assessable part of a manuscript, so it must stand alone. Authors should ensure that the abstract is concise and free of any specific abbreviations or experimental details. As a snapshot of the whole paper, the abstract should be written after the finished draft is ready. Once written, the abstract should be revised till the final form is concise and coherent.

Things to avoid: (i) Excess word count; (ii) Vague language and run-through sentences; (iii) Excess detail about experimental procedures and results and (iv) Inclusion of references.

Graphical abstract

A picture is worth a thousand words. Some journals (e.g. Elsevier) take this adage rather seriously and require/suggest that authors submit a graphical abstract with the manuscript. A well-designed graphical abstract is the quickest way to both attract the attention of readers and

convey the key message of a paper. To prepare a graphical abstract, authors should first write the final abstract and use it to conceptualize the figure. For designing the graphics, professional software (e.g. Inkscape, Biorender, adobe illustrator) should be used (Table 1). A rough sketch can be discussed with colleagues for further improvement. The final figure should be clean and of high resolution. The labels must be legible and details uncluttered.

Things to avoid: (i) Poor figure quality and resolution; (ii) Too much information about results or procedures; (iii) Poor labelling and (iv) Lack of a clear message/theme.

Highlights

Some journals require the submission of research highlights along with the abstract. These are a collection of 4–5 bullet points which showcase the major findings of one's study in their crystallized form and highlight their novelty. Highlights are reader-centric, so only the most essential points should make it to the list. To begin with, authors must read the introduction, discussion and conclusion sequentially and note down the most important points. After compiling the initial list, one must discuss with colleagues, go through them again and reduce their number and word count. The final word count per point is generally 85 characters, including spaces (less than a tweet); so the editing must be on point. The rationale for the study or experimental procedures should ideally not be mentioned. The finalized highlights should state the key findings of the study in their most concise and condensed form.

Title page

The title page should be prepared in compliance with the guidelines of the target journal. It must contain all of the information required by the journal, such as the list of authors, their contact information and their affiliation (Figure 3 and Box 1).

Title: 'a lot' lies in the name: Title is the face of an article that must attract both the editors and prospective readers. It should be objective and establish the premise of the study without over/underplaying its significance. Moreover, technical jargon and abbreviations should be avoided. Long rambling titles with too much information dilute the impact and may not catch the attention of readers. One working strategy to construct a title is to select a number of most significant words in the Results and Discussion section (as well as Methodology, if a novel approach/protocol/platform was used) and make coherent working titles from the mixing and matching of these. A few cycles of reiteration and inputs from fellow authors and colleagues should result in a polished title.

Box 1. Checklist for submission

- Paper matches the aims and scope of the target journal.
- Manuscript formatting meets journal guidelines and reference style.
- Cover letter highlights the novelty and significance of the work; is drafted on official letterhead with corresponding author's affiliation and contact details.
- Three/five potential reviewers (and specific exceptions) are listed, along with their expertise, affiliations and contact information.
- Authorship statement is signed by all authors; with clear indication of contribution.
- Signed statements regarding potential conflict of interest are enclosed.
- In case of animal/human studies, approval letters from relevant authorities are enclosed.
- In case of human studies, signed agreements from test subjects are present.
- Signed copyright transfer agreement is enclosed.
- Manuscript contains standard sections with all the numbered, labelled components with main figures and tables outside the main text. No annotations/highlights exist, except line numbers.
- Title is short and informative and running title is different from main title.
- Title page includes the following information:
 - ◆ Article title and category.
 - ◆ Name(s), affiliation(s) and contact information of the author(s).
 - ◆ Three to five keywords, preferably MeSH terms (arranged alphabetically).
 - ◆ Total number of figures and tables (main, supplementary; marked as being intended for: colour reproduction in print/online or greyscale).
 - ◆ Word count (from introduction to conclusion, excluding references and legends).
 - ◆ Corresponding author details (name, e-mail, mailing address, telephone and fax numbers).
 - ◆ Short running title not exceeding 50 characters.
 - ◆ Highlights (maximum 3–5) based on the main findings.
- Abstract is a snapshot of the whole paper with emphasis on the novelty and/or significance of the findings and is styled (structured/unstructured) according to the journal guidelines (within 250 words).
- Introduction is concise, directional and specific to the objective and discussion with emphasis on the novelty and significance of the study (1.5–2 pages).
- Materials and methods section includes a brief rationale, detailed protocols information with due references and explanation of the analysis, if necessary (3–5 pages).
- Experimental approach is statistically sound and findings are validated by appropriate statistical tests.
- Figures and tables are clean, properly scaled, labelled and cohesively panelled parallel to in-text story flow (figures: 6–8 and tables: 1–3; one per page).
- Figure legends and table headings are present on new pages (double spaced).
- Figures' resolution matches journal guidelines; e.g. standard resolution for halftone images (300 dpi), combination art (halftone + line art, 600 dpi) and line art (1000 dpi).
- Discussion is concise, discusses key inferences placed in global context and their implications, and addresses alternatives and contradictions (4–6 pages).
- Conclusion indicates the take-home message, their significance and contribution towards scientific advancement, future prospects/applications and suggestions for future experiments (1 paragraph).
- Symbols, abbreviations and notations are standard, described at first appearance in text and uniformly used across the manuscript.
- In-text information flow is smooth with concise, informative sentences and devoid of spelling and grammar related-errors.
- In-text plagiarism is less than 5% in total and less than 1% individually.
- Bibliography is complete with recent and original references numbered in the order of appearance in the text/figures/tables and formatted according to journal guidelines (20–50 papers/2–4 pages).
- Funding statement is included with details including funding agency, grant number and scholarships number.

Things to avoid: (i) Long, complex, run-through titles, (ii) Technical jargon and abbreviations, (iii) Too much/too little information about the study and (iv) Overplaying/downplaying the inferences.

Selecting keywords – a labelling issue: Keywords are the labels of a paper, important for increasing its search-

ability in the enormous selection of papers. A good selection contains terms both specific to one's work and used generally in the field of study. To select keywords, a list of the most important terms used in one's study must be prepared. Generally, these may be derived from the biological question being studied, the most important method used, discussion highlights and major conclusions. While

most of the important keywords tend to appear in the abstract, they should not appear in the abstract and title. This can increase the number of terms which would return your paper upon a casual search and thereby increase its outreach and your citations. However, when looking for keywords, one must avoid words with a broad meaning and those already included in the title.

Things to avoid: (i) Too specific/too general terms and (ii) Terms already present in the title/running title/abstract.

References

This section includes all the papers referred by the authors throughout the manuscript. It is a balancing act; citing suitable number of peer-reviewed articles adds scientific credibility to one's work and connects it to the ongoing research scenario. Wherever appropriate, original papers must be used instead of reviews, unless the latter is of direct relevance to one's arguments.

Referencing begins before the actual writing commences, i.e. when authors get into the mindset of writing. This is a good time to save citations directly using software like EndNote, Mendeley and Zotero for building up bibliography (Table 1). In case of future rejection, this also facilitates hassle-free switch between different journal styles. It is advisable to adhere to journal guidelines for preparation of bibliography and in-text citations. Authors should avoid too many self-citations, personal communications, unreviewed manuscripts or non-English articles.

Things to avoid: (i) Manual preparation of reference list; (ii) Too old/too general references; (iii) Redundant references and self-citations and (iv) Personal communications, unreviewed manuscripts or non-English articles.

Acknowledgements

In this section, authors should acknowledge the funding agency/grant number which provided the funds for conducting the study. In addition, they can mention individuals who have contributed to the manuscript in some capacity, be it critical reading or technical support. Authors must be sure to indicate their affiliation and exact contribution while writing this section.

Supplemental information

In general, supplementary information includes all the experimental data and associated material which support, but are not essential for drawing the principal conclusions. Any extraneous data which are not directly related to one's arguments should not be included in supplementary information. Similar to the main figures, authors should suitably annotate the supplemental figures or tables for easy perusal by interested readers.

Communicating the manuscript

Once the figures and abstract are ready, authors can begin communicating with the journal(s) of interest. This section deals with preparation of the cover letter and points to consider before final submission.

Preparing the cover letter

Editors receive a large number of manuscripts, and they must select those that offer novel, impactful findings of direct interest to the readers. A cover letter is essentially one's sales pitch to the editor. One, it introduces findings of an article to the editor and highlights their novelty and significance in advancing knowledge in the research field. Second, it effectively connects the article to the scope of the journal and through that, the relevant audience. Therefore, a persuasive cover letter is a must for the acceptance of a manuscript.

As the cover letter is the first correspondence with an editor, authors must be professional and courteous. The letter should be one page long and addressed to the editor by name (along with proper salutation and address). One must begin by introducing the manuscript (its title and type, e.g. research article, mini-review, short communication) and end the preamble by stating that in the author's opinion it fits the scope of the journal, without undue exaggeration. The main body should contain 3–4 points.

(i) Focus: The biological question being addressed must be briefly explained as well as the main experimental approach taken and the principal findings (e.g. mechanistic insights in case of basic studies) of the manuscript. While there may be some overlap with the abstract, redundancies should be minimized.

(ii) Strength: Most journals are not interested in publishing incremental advancements. Thus, the second point should clearly indicate how the findings of the study contribute significantly towards the conceptual advancement in the respective field. Any new methodology or novel protocol developed must be highlighted, as a technical advancement. The aim is to convince the editor that the manuscript will be well cited and increase the journal's impact.

(iii) Connection: Authors must emphasize the large-scale implications of their work for its respective field, keeping the journal's scope in mind. A direct connection must be established between one's research, and the scope and readership of the journal. For instance, if it is a niche journal, author must indicate its direct relevance to the focused readership. If the journal is broad in scope, the interdisciplinary nature and wider impact of the findings must be highlighted.

Finally, authors must refer to the journal guidelines for any specific formatting requirements. For instance, all journals require the incorporation of certain details, e.g.

statements (the manuscript represents original work, not published/being considered elsewhere), disclosures (no conflict of interest exists among authors), or information (potential reviewers or exclusions; Box 1). The cover letter is confidential; hence any details that may be relevant for editorial assessment should also be included. Authors must conclude by thanking the editor for his/her consideration; and express hope that the manuscript will be positively received. The full designation, address and contact details of the authors must be included.

Things to avoid: (i) Citing information available in the manuscript; (ii) Boast about academic prestige or past publications; (iii) Complex, run through sentences and (iv) Redundancy with abstract.

General guidelines for submission

Authors should refer the submission guidelines of their target journal and adapt their manuscript accordingly (if not done so already). In general, a standard manuscript is of 25–40 pages, has a simple font, is double-spaced and contains essential data only (Box 1). For a standard submission, the following points can be considered:

- Title: Short and informative.
- Running title: Concise and different from the main title.
- Abstract: snapshot of the paper; one paragraph (<250 words).
- Introduction: Concise, directional and specific to the objective and discussion; 1.5–2 pages.
- Methods: Brief/detailed for old/new protocols with statistical information; 2–3 pages.
- Results: Summary of key results related to the story flow; 6–8 pages.
- Discussion: Key inferences explained in context of existing knowledge and their implications; 4–6 pages.
- Conclusion: Take-home message, their significance and contribution towards scientific advancement; 1 paragraph.
- Figures: Clean, properly labelled, scaled and in-flow; 6–8 (one per page).
- Tables: Clean, properly labelled and precisely worded; 1–3 (one per page)
- References: Recent, original and appropriately formatted; 20–50 papers (2–4 pages).

Final checks

Author must refer to the journal guidelines for formatting your manuscript: Given the increasing number of journal submissions, a poorly formatted manuscript has less chance of receiving favourable consideration. Thus authors must ensure that they have met all the requirements before submitting their manuscript (Box 1). These include

word limits (strictly followed), language requirements (grammar, US or UK English), references (properly formatted) and specifically the figures (format (.jpg/.png/.pdf/.ppt) and positioning (within text, end of manuscript, supplied as separate files)).

All legal formalities must be completed: If the study needs prior acquisition of any ethical and regulatory permissions, these details must be included with the cover letter (Box 1). There should not be any conflict of interest among co-authors; if required, a consent form signed prior to submission can be obtained. In case there is a potential cause of conflict, it must be disclosed and explained at this point. These details must be worked out before submission itself to avoid any potential dispute in future.

Common mistakes should be avoided: The manuscript must be consistent with the usage of certain terms, such as species names, non-standard abbreviations, use of *et al.*, author names, references and the year of publication.

Simple and concise language must be used throughout the manuscript: Editors and readers are likely to lose interest in complex, long-winded sentences. The manuscript must be able to convey its central idea in a simple, concise language, free of superfluous terms and unnecessary adjectives. Authors should employ tools like Grammarly and Ginger to minimize plagiarism and ensure grammatical accuracy (Table 1).

A free flowing and engaging narrative must be ensured for the readers: As mentioned before, scientific communication must also capture and retain the interest of prospective readers. Before submission, it must be ensured that the manuscript is structured well and information flow is seamless. Within reason, using a first-person voice lends a dynamic tone to the manuscript and reduces the word count.

Authors must prepare for rejection in advance: Whether one's manuscript is accepted in his/her journal of interest is determined by a number of factors not entirely in their hands. As mentioned before, having a prior list of alternative journals permits faster switch into new journal format, which saves critical time before fresh submission.

Peer review and revision

If the paper meets editorial standards, it will be forwarded for peer-review, which evaluates your manuscript from multiple aspects, including scientific relevance, technical soundness and overall quality. Depending upon the reviewers' response, the manuscript may be returned to the author for revision/rejection. There are three different post-review scenarios that authors generally come across.

Minor revision

This implies that the reviewers agree with the scientific rigour and relevance of the study. They may raise minor issues, such as strengthening the discussion, improving the language (e.g. quality and grammar), reducing redundancy, addition of updated/direct references and minor alteration of existing figures. These issues often do not require additional experimentation and can be easily resolved according to the reviewers' suggestions.

Major revision/reject and resubmit

This is a make or break situation. Reviewers might feel that despite interesting results, the final conclusion is weakly supported, either due to lack of direct evidence or poor writing, which fails to convey the main idea. Instead of an outright rejection, they generally suggest additional experimentation and major structural overhaul of manuscript before resubmission. Done well, major revision can enhance the quality of a manuscript. Broadly speaking, authors can address principal concerns raised by the reviewers in the following ways:

(i) Additional experimentation to validate the conclusion: Reviewers find that presented evidence is too preliminary/indirect/correlative to support the proposed conclusion. In such cases they can suggest further experiments to obtain more solid evidence. As and when possible, authors should try to carry out the required experiments and incorporate these data to revise their conclusions accordingly. The additional insight thus gained can greatly enhance the scientific rigour of one's study, along with its chances of acceptance upon revision/resubmission.

(ii) No further experimentation and rebuttal through explanation: Although experimental evidence is the gold standard, sometimes reviewers may suggest experiments that are either unfeasible or beyond the scope of the paper. In such cases, authors can address the reviewers' comments through scientifically robust explanations that are strongly supported by either the existing data or academic precedent in the form of recent (e.g. within last three years) and original (high impact) articles. If needed, authors can also make a compilation of such references and include them in the supplementary information. The explanation must be objective and strong enough to supplement the absence of wet laboratory data.

(iii) Major organizational changes in manuscript structure: Occasionally reviewers might feel that the main idea is not being effectively conveyed due to obscure composition, poorly stated/vague arguments, lack of strong examples, or imbalance or redundancy in the text. Authors should make these changes accordingly to improve the overall manuscript quality. Large sections of material must be deleted if required; every line should impart value to the text. Wherever appropriate, word economy should

be practiced so that the overall narrative is concise and key points emerge prominently.

(iv) Acknowledging comments without any alterations: In some cases, reviewers are just expressing their opinions, which do not require any changes to be made. These comments must be politely acknowledged.

Rejection

If the reviewers feel that the study has a weak objective (theoretically invalid), is technically unsound (inadequate sample size, lack of proper controls, inadequate/wrong/outdated methodology, statistically weak), has inadequate results (do not answer the biological question) or poor analysis and interpretation (incorrect or poorly supported conclusions, they might reject it after review (<https://www.springer.com/gp/authors-editors/authorandreviewertutorials/>). Editors may also reject the manuscript if they feel that it is out of scope, does not significantly advance the respective field, falls short of research or publication ethics, and is of overall poor editorial quality.

Authors should take due time to process the rejection, and thereafter peruse the comments rationally. Usually reviewers add detailed comments regarding the issues which have led to the rejection of the paper, such as lack of robust experimental data. Authors should re-evaluate their strategy and complete the suggested experiments for a major restructuring of their manuscript. Editorial rejection can be addressed by developing a quality manuscript, adhering to journal guidelines and careful selection of the journal for submission (<https://www.springer.com/gp/authors-editors/authorandreviewertutorials/>). Addressing these concerns can enhance the overall quality of the paper and increase its chances of acceptance in the next communication.

How to carry out revision

Reorient one's mindset: Revision is not just proofreading or editing. It is a time-taking exercise that entails intensive thinking and mindful writing. Successful revision often requires major structural changes to crystallize one's arguments and bring the principal idea into focus. Since an objective assessment of a manuscript's projection can be difficult after the rigorous pre-submission refinement, it is advisable to take adequate time-off before starting the revision. This would permit the critical self-evaluation necessary for addressing the major issues with the manuscript.

Objectively assessing a paper according to reviewers' comments: Simultaneous perusal of the manuscript and comments can indicate the type of issues raised by the reviewers; these can be scientific, organizational, compositional or sentence-related. Authors should go through

all the comments carefully and group related comments to identify problem areas. These sections must be annotated in the manuscript as the changes need to be highlighted in the rebuttal letter.

Revision to follow a directional sequence: Similar to manuscript drafting, revision should also follow a certain sequence as the amount of work each section requires is not equal. The following sequence can be followed for the most frequently revised sections:

Results: Typical issues with results could include lack of connectivity between passages, excessive descriptive detail about results, inclusion of methods or inferences, and excessive use of highlighters (e.g. highly significant). Results follow the same sequence as figures; so each paragraph should pick up the lead from the preceding paragraph (e.g. using connectors such as ‘to investigate’ or to ‘address’), convey a definite thematic point and prepare the background for the next point of query. Any new information must be incorporated in the existing structure and modified accordingly for a seamless flow. Unless necessary, methods or inferences must be included here. Word economy must be practised and wherever needed, *P* values must be provided to indicate significance level to highlight the key results. A final read through should inform one about any discrepancy in the text.

Discussion: This can have multiple issues, ranging from a weak narrative, poorly drawn inferences, over/under estimation of the significance of results and redundancy with results. In case of additional experimentation, those inferences must be assimilated with the existing narrative. Based on the new evidence, the discussion can either be reworked completely or adjusted to accommodate the additional points. These inferences must be linked with the ideas and hypothesis proposed earlier in the Introduction section. A comprehensive literature survey must be done so that the revised inferences can be compared with the existing knowledge and implications, both general and specific. There might be certain issues that the authors cannot fully address these caveats must be acknowledged and if possible, explained with sound scientific arguments. Authors must be careful about claiming novelty or significance for their study; such assertions must be supported by an extensive literature survey. As much as possible, redundancy with results must be minimized. Authors must be concise and if needed, use active voice for a fresh and crisp narrative.

Conclusion: Vagueness, verbosity, unsupported speculation and overestimation of the significance/novelty are some of the most common issues with this section. Once the discussion is restructured, the most important point must be crystallized to highlight its significance for scientific advancement. It is advisable to carry out a

thorough background check before claiming novelty for one’s work. Although some speculation about the wider implications of their study is only natural, authors should refrain from making far-reaching/unsupported claims without strong foundation.

Introduction: A disproportionate or unstimulating introduction is a frequently raised issue during peer review. Despite pre-submission editing, introduction can be riddled with unnecessary and non-specific details. After revising the discussion and conclusion, authors must re-evaluate the introduction and compare it with the reviewer comments. They should be able to identify parts which stick out from the overall narrative and are no longer essential for establishing the study. These parts must be edited out and the information required for understanding any additional data must be incorporated. Authors must emphasize the parts directly related to highlights of their discussion. Since authors have to link the questions raised in the introduction with solutions detailed in the discussion, the final introduction should be highly specific to one’s arguments. Finally, authors must be precise and use simple sentences to convey their point effectively.

General formatting: Revision frequently entails sentence-level changes to be made throughout the manuscript for a concise, free flowing narrative. Authors must identify the sentences that are too complex, vague, run through, redundant and riddled with fillers, adjectives or repeat words from the preceding sentence. Such sentences must either be modified or completely rewritten; the aim being concise delivery of information. Repeatedly used terms must be replaced with alternatives (preferably prevalent in the scientific literature), bringing variety into sentence structure.

Things to remember

Revision is an extensive and exacting exercise which requires addressing a variety of issues. Before one begins, these issues must be ranked from the most critical to the minor ones, 4–5 differently ranked tasks can be coupled to be addressed in a single focused session.

Whether it is the quality of writing, polishing of figures or accuracy of facts, high standards must be set. Authors must not hesitate to edit out their favourite points if they no longer fit the narrative. Sentence associated proofreading should be done only after the major structural or organizational changes have been made.

Preparing a rebuttal letter

After revising the manuscript, the next step is to prepare a rebuttal letter that addresses reviewers’ comments in a detailed, pointwise manner (Box 1). This informs the

reviewers about the extent to which the manuscript has been modified. Most reviewers are busy senior academics who voluntarily devote their valuable time and energy for reviewing a paper. Thus, it is imperative that the author retain a polite and professional tone in his/her responses, provide explanation wherever possible and not leave any scope for confusion. The basic idea is to ease the reviewers' job so that the peer-review process goes smoothly and turn around is fast. The following points can be considered while preparing the rebuttal letter:

First, authors must express gratitude to the reviewers for their effort and indicate that they have revised the manuscript and are resubmitting it for consideration. They can also highlight any major changes made in the revised version.

While responding to individual comments, one must begin with acknowledging the reviewers' points and preface the response appropriately. If the authors agree with the reviewers comments, they must begin with phrases like 'We agree with your assessment' or 'Thank you for your suggestion'. If they disagree diplomatic phrases like 'This is an interesting perspective/point' can be used.

If the authors have modified the text, it must be indicated using terms like 'As suggested/asked by the reviewer', followed by citing the revised text in parenthesis. The line and page number must always be mentioned in bold at the end of the response. The revised manuscript must be annotated accordingly for a quick and easy perusal.

Any figures or tables prepared as a part of the revision, whether new or modified, should be clearly mentioned in related answer, along with its position in the revised manuscript. For the convenience of the reviewer, these must be included under a separate annexure and indicated accordingly. If the authors do not agree/cannot comply with the reviewer comments, such as additional experimentation, they must respond objectively and provide solid reasons.

Whenever using any academic precedent to support their point, authors must cite the complete references at the bottom. If authors feel that the reviewers are biased or have overlooked their point, they must not assume an antagonizing tone. Authors must remain objective and indicate the erroneous and/or biased assessment specifically on a comment-wise basis.

Preparing a revised cover letter

The revised manuscript should be accompanied with a revised cover letter (Box 1). Like the original, the revised letter should reiterate the significance of the paper for its field of study. Unlike the original, it should focus on how the authors have successfully addressed the reviewers' concerns, be it through additional experiments, major restructuring of the manuscript and/or toning down their claims. Authors must be polite and professional and keep a positive tone while requesting for reconsideration.

Authors must be mindful of the following points before final submission (adapted from writingcenter.unc.edu).

- The revised discussion answers the biological question raised in the introduction.
- The restructured manuscript is precise with a seamless transition of well-organized information.
- Manuscript articulates key arguments in a simple but elegant way.
- The narrative is engaging; the abstract, introduction and conclusion must specifically end on a stimulating note.
- Figures are polished and stand alone.

Rejection and appeal

In case of rejection, the authors can either submit the manuscript to a different journal, or appeal for reconsideration. The latter takes a considerable time, being kept on lower priority than new submissions, and mostly ends in rejection. More importantly, the manuscript gets significantly delayed, which can be a serious concern in time-sensitive studies. Thus, authors should pursue this prolonged route only if they are absolutely convinced of there being a serious mistake in the peer review process and they specifically want to target the journal in question and its appeal resolution time is comparable to the time taken for first decision in the next candidate journal (<http://blogs.nature.com/methagora/2013/09/how-to-write-an-appeal-letter.html>). There are two points over which the decision can be reversed: (1) The authors are able to establish that a particularly referee has, deliberately or unknowingly, committed a serious error in the peer-review process. Such assertions must be strongly supported by specific evidence to that effect. (2) The authors strongly assert that their work meets the journal standards of scientific novelty and broad-reaching impact. This is accomplished by providing considerable amount of new data and explaining its relevance to addressing major shortcomings highlighted by the reviewers.

Like a cover letter, an appeal letter is meant for the editors only; so this information can be safely shared, without antagonizing the referees. However, unlike the cover letter, appeals reinforce the novelty and broad-reaching impact of the manuscript only in light of new evidence, or by providing an objective, evidence-backed response to reviewers' comments. A typical appeal letter must be addressed to the editorial office, be polite and objective in its tone, and should include the following points, on a case by case basis (<https://www.springer.com/gp/authors-editors/authorandreviewertutorials/submitting-to-a-journal-and-peer-review/when-to-dispute-a-decision/10285586>):

- Scientific explanation for disagreeing with their decision.

- A point-by-point rebuttal to the reviewers' comments, which may assist in reconsideration. If the reviewers have highlighted some specific shortcomings, authors must include a detailed plan for addressing those.
- New data (e.g. figures and data plots), which strengthen the novelty-significance argument. This must not overlap with/reiterate the arguments given in original cover letter.
- An evidence-based statement which highlights specific instances where the reviewers have been negligent, biased or technically incorrect in their assessment.

Depending on the original response of the reviewers and the strength of the author's arguments, the appeal can have one of three possible outcomes. If all goes well, the rejection will be overturned; the paper will either be directly accepted for publication, or authors will be asked to resubmit, which does not guarantee future acceptance. In the worst case scenario, the rejection is sustained and editors will entertain no further appeals in this regard.

Post-acceptance processing: gearing up for publication

After the manuscript is accepted, the editorial office will check it again before sending it to the production team. Thereafter, the corresponding authors receive further details pertaining to proof preparation, such as the timeline and link for tracking its progress. While the entire process is journal-specific, generally the manuscript undergoes copy-editing and typesetting by the production team. In case of high-impact journals, this may involve substantial subediting to fit their style and format. In case there are some minor issues (e.g. references) additional queries may be sent to the corresponding author. Depending upon the journal, the initial proof may take up to 30 days for preparation. Authors will be asked to proofread it and make any changes/answer any queries before sending back the proof. The corrected proof is published on-line first and thereafter sent for print.

Post-publication networking: spread the word

Though published, any article remains one among the many unless highlighted. The question remains, what sets it apart? This is when the post-publication networking comes into picture. Social media is a powerful tool for dissemination of information and is currently being used by scientists worldwide to publicize their articles. General platforms like Twitter and Facebook are ideal for researchers to globally highlight their research, while professional networks like Research gate are oriented towards sharing research and building communities for future learning, collaborations and citations. Used properly, the social media has enormous potential for determining

how scientific literature is received in academia, as informed by indicators like the altmetric index⁴. While intellectual property or confidentiality issues are still in the grey area, authors should be aware and willing to exploit the social media buzz for a wide dissemination of new findings. After all, the success of a paper is determined by its citations and outreach in the scientific community.

Conclusion

The importance of good scientific writing for successful dissemination of scientific knowledge cannot be overstated. In this article, we have identified the key elements of scientific writing which are essential for positive reception by both editors and reviewers. Due to the large number of submissions in peer-reviewed journals each year, an average manuscript can get rejected despite substantial investment of time and effort in its development. We have addressed this issue by proposing a microstructure framework for manuscript preparation, with practical suggestions for its stepwise development. By providing a writing toolkit aimed at enhancing overall manuscript quality, we have streamlined the scientific writing process for both new and seasoned authors. We have also provided detailed instructions for addressing the complexities associated with scientific communication. This will allow new authors to successfully negotiate both revisions and appeals. Finally, we have highlighted the role of social networking platforms in ensuring the dissemination of a research articles to its pertinent audience. By following our roadmap, novice authors can successfully develop a good-quality manuscript and ensure its positive reception and broad outreach in the scientific community.

Conflict of interest: There is no conflict of interest among the authors.

Data availability statement: The data that support the findings of this study are available on request from the corresponding author. They are not publicly available due to privacy or ethical restrictions.

1. Setter, T. L., Munns, R., Stefanova, K. and Shabala, S., What makes a plant science manuscript successful for publication? *Funct. Plant Biol.*, 2020, **47**, 1138–1146.
2. Gewin, V., How to write a first-class paper? *Nature*, 2018, **555**, 7694.
3. O'Donoghue, S. I. *et al.*, Visualization of biomedical data. *Annu. Rev. Biomed. Data Sci.*, 2018, **1**, 275–304.
4. Osterrieder, A., The value and use of social media as a communication tool in the plant sciences. *Plant Methods*, 2013, **9**, 26.

Received 23 June 2021; accepted 18 September 2021

doi: 10.18520/cs/v121/i9/1162-1179