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Pacific Northwest
NATIONAL LABORATORY

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POCKET GUIDE **for Publishing**

IN THE NATIONAL SECURITY DIRECTORATE

U.S. DEPARTMENT OF
ENERGY



**Publishing
at PNNL**



**Ethics in
Publishing**



**Scientific
Writing**



**Scientific
Style**



**Titles &
Abstracts**



**Preparing
Figures &
Tables**



**Managing
Resources
& Time**



**Reader
Expectations**



**The First
Draft**



**Collaboration
& Co-authorship**



**Reviewing &
Refereeing**



**Final Version
& Submission**



**Best
Practices**





Publishing at PNNL

Publication is the primary conduit by which scientists and engineering professionals disseminate their research. “Publish or perish” is a concept heard in academic circles. This is a touchy subject for some who work in fields that may not have traditionally published as much as other disciplines. However, as science becomes more collaborative and more non-traditional publication venues are embraced (e.g., blogs and open access journals), the concept of “publish or perish” is undergoing some transition. The bottom line is that no matter the forum in which you publish, metrics can be (and are) applied to journals, conferences, publishers, and even individual researchers. There is simply no getting around it – you will be measured and will become known by your publications, or lack thereof. Good scientific writing is crucial to your discipline, your career, and the business objectives of PNNL.

Publishing is one way in which we show how tax payer monies are being spent and that we consistently deliver world-class science and technology. PNNL sets annual publishing goals for each directorate. These are set by the Deputy Director for Science & Technology in conjunction with Lab leadership. In addition, the Laboratory also tracks the number of highly cited papers, the number of peer-reviewed publications per research staff, and more. As you progress and promote through the ranks of the Scientist & Engineer job family, you are expected to contribute to the national and international scientific community through publication, presentations, etc.

This guide communicates the importance of publishing in the National Security Directorate (NSD) and serves as a resource directory highlighting major components of peer-reviewed publishing; provides quick bits of insight and information; and is a quick reference guide to contacts, websites, and more.



Ethics in Publishing

Integrity and trust are the hallmarks of the scientific discovery and publication processes. Being objective and honest are key to managing one's reputation and are fundamental in seeking jobs or promotions and sustaining research support. Internal policies and procedures, coupled with submission guidelines and ethical standards, can be difficult to navigate. Be in the know – seek help when needed and always verify expectations with the *Guidelines for Authors* and/or professional standards provided by the publication venue.

In NSD it is a requirement to have all technical information reviewed by a Derivative Classifier (formerly called Authorized Derivative Classifier [ADC]) prior to its dissemination internally or externally. This review ensures that no sensitive or classified information is communicated improperly. For more information on this process and to locate a Derivative Classifier, review the *General Classification Guidance for Staff* procedure in HDI, <https://hdi.pnl.gov/hdi/product/exhibits/gnrc1ssguistf.doc>.

BATTELLE STANDARDS OF BUSINESS ETHICS AND CONDUCT

As an employee of PNNL you are required to comply with the Battelle Standards of Business Ethics and Conduct which relates directly to publishing scientific research. As the Standards state,

“Scientific misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. Fabrication is making up results and recording or reporting them. Falsification is manipulating research materials, equipment or processes, or changing or omitting data or results such that the research is not accurately represented in the research record. Plagiarism is the appropriation of another person’s



Ethics in Publishing

ideas, processes, results, or words without giving appropriate credit, including those obtained through confidential review of other's research proposals and manuscripts. As a Battelle staff member, you are also expected to conform to all of the legal, regulatory and contractual requirements related to the conduct of your work. Questions regarding such requirements should be directed to the Legal Department."
(See contacts at end of the Publishing Guide)

RESEARCH PROTOCOLS

Research at PNNL must be conducted in accordance to a multitude of laws, regulations, and requirements at the local, state, and national levels and in accordance with the U.S. Department of Energy and other client needs/requests.

Depending upon the type of research being proposed, consult *How Do I?* (HDI) to identify the work controls applicable and to read the *Basic Laboratory and Operations Practices* guidance.

If using human subjects in a research study (including specimens or collected data), consult with the Institutional Review Board (IRB) to discuss the study and determine anticipated level of IRB review.

IRB review and approval is required:

- » Before human subjects research activities can be initiated
- » Before changes to an approved human research protocol may be initiated
- » At the time of continuing review
- » When problems or noncompliance occur.

Human subject research activities at PNNL must be conducted in accordance with the approved protocol, consent, and supporting documents. Most research journals will not publish the results of human subject research if IRB approval has not been obtained and in many cases you are required to provide the IRB approval number. In addition,

there can be other consequences beyond rejection by a journal, such as loss of professional reputation.

COPYRIGHT

Incorporating previously published materials (e.g., figures, tables, photographs) in your publication requires obtaining permission from the author and/or the publisher. This may include materials you have already published. Some publishers require the use of a standard form provided on their website while others use a central clearinghouse such as *Rights Central*. Contact the copyright owner directly and provide the following information:

- » What you want to reproduce (e.g., Figure 1)
- » Where the figure/table was published (e.g., specific article/book citation)
- » Where/how you want to use it (description of your proposed publication)
- » If appropriate, include information about how your item will be distributed.

When your article is accepted for publication you will be asked to sign a copyright release and transfer form. PNNL staff are not authorized to sign copyright forms or click-through online forms – the Legal Department has authorized Information Release staff to provide this service.

COPYRIGHT CHECKLIST

- » Electronic copyright forms are not acceptable. If there is not an option to download the form online, contact the journal editor to acquire one.
- » Fill out the copyright form to the best of your ability. PNNL staff are government contractors. **Do not** check “government employee” box.



Ethics in Publishing

- » Include the ERICA clearance number (see Information Release section below) after the article title in parentheses.
- » If the form lists all authors, place an asterisk next to the names of the PNNL staff. The non-PNNL authors should submit their own form.
- » Send prepared and scanned forms to Information release at ^PNNL Information Release or hardcopy to K3-78.

Remember: Co-authors at other institutions do not have the authority to sign forms for PNNL staff (nor do we have the authority to sign for non-PNNL authors).

INFORMATION RELEASE

Scientific and technical information products (e.g., journal articles, conference papers) developed by staff and non-staff performing work for PNNL that includes information about Battelle, organizations, or programs sponsored by Battelle, or work performed at or by PNNL must be internally reviewed and receive an Information Release number (may also be referred to as an ERICA number) before being distributed externally. To conduct Information Release, use ERICA, the “Electronic Records and Information Capture Architecture” system.

ERICA is PNNL’s online system which: automates and tracks the Information Release process from the time that an Information Release form is initiated, through approvals, to the point of publication/external release; assigns an Information Release number to each product; captures information about what is being released outside PNNL (to clients or to the public) by PNNL authors; makes this information available, when appropriate, to the PNNL external publication’s web site and to DOE’s Office of Scientific and Technical Information; and makes this information available, when appropriate, to staff for Staff Development Reviews, annual reports, bibliometric analysis, etc.

For assistance with the Information Release process or with using ERICA, contact the Information Release Office at (509) 375-2929 or by email, ^PNNL Information Release.

ERICA CHECKLIST

- » To complete the Information Release process and obtain an ERICA clearance number for the paper, you may want to work with your group administrator. S/he can facilitate the process on your behalf.
- » Be prepared to provide all necessary information to your administrator including the document, title, authors, abstract, journal name, and the name of a qualified internal peer reviewer. Depending on your project, you may have a technical editor and in NSD, all technical information must be reviewed by a Derivative Classifier.
- » You will need to identify a "Responsible Author." This is the staff member who takes ownership of ensuring the release process is completed and updating the Information Release record.
- » You may need to provide a work package number for staff to review and approve your document.
- » The ERICA system will route your request. At any time you or the person who entered the data in ERICA can track the clearance progress.
- » After the article is published externally (e.g., in the journal), and contact your group administrator to update the Information Release record to reflect the change in publication status.

USEFUL LINKS

How Do I? (HDI), <https://hdi.pnl.gov>

Basic Laboratory and Operations Practices, <http://1.usa.gov/1yjRWKC>

Information Release, <https://ir.pnl.gov>

ERICA, <https://erica.pnl.gov>



Scientific Writing

Original research must be published; only then can new scientific knowledge be shared. Scientific publications come in many forms – technical reports, conference papers, presentations, proposals, and whitepapers, to name a few. However, this guide focuses on writing for peer-reviewed journals. Most scientists are rarely afforded the opportunity to take technical writing courses in graduate school. This may account for some staff members' hesitancy or fears about writing for publication. While this is not a how-to guide for technical writing, you can learn to write with clarity and purpose. If you do good research and present it clearly, you will become an effective and successful author without oversimplifying scientific concepts.

FINDING THE RIGHT FIT

Finding the right journal for your article is as important as writing a good article. There are thousands of journals covering all fields of research. You need to choose carefully. But which is the “right” journal? Develop a strategy for publishing; understand what you are trying to achieve and why.

Ask Yourself

- » Which are the best known journals on your subject? Which journals currently publish this work?
- » Which journals did you find valuable when doing your research?
- » Which journals have the best reputation for publishing high-quality science in this field and are most likely to be cited by others?
- » Where are other experts in this field publishing? Which journals have reviewers with expertise that would ensure that your paper is given a “fair hearing?”
- » Are there journals whose readership you need/want to influence?
- » Is your work time sensitive? How often is the journal published? What is the usual time-lag between receiving and publishing papers?



Journal Selection Checklist

Accessibility, coverage, quality, and timeliness are all motivating factors in journal selection. Once you've narrowed the list to a manageable few, consult the checklist.

- » Review *Tables of Contents*, especially in the most recently published issues. As journals become increasingly specialized, they may only focus on one small niche within your field.
- » Read *Guidelines for Authors* to find information on the scope of the journal, impact factor, readership, indexing, etc.
- » What's hot, what's not? Read current journal issue editorials as they usually reveal the preoccupations of the editors and reviewers.
- » Have a conversation and ask your colleagues for advice. If they are publishing in the same field take advantage of their leg work.

Keep in mind that most of us will not publish in a top ranked journal for many years - if ever! So, if several lower ranked journals appear suitable for your work, how do you choose? There are many things to consider. Ask yourself the following questions to shorten your list:

- » How long has the journal been in publication?
- » Does it have an impact factor (even if low)?
- » Is it available electronically?
- » Is it indexed?

Even if your work isn't published in a "top tier" journal, if it is indexed in a scholarly database and available worldwide, you are increasing your odds of others finding and citing your work.

NOTES:



Scientific Style

Scientific articles are used to present research that has not been published previously, is peer-reviewed, and can be used by others as a source and guide for their own research. There are many different types of scientific articles and the journal you submit to may have distinct types of submissions.

TYPES OF PAPERS

- » **Empirical studies** – report original research, highlighting different steps in the research process including data derived from actual observation or experimentation. Empirical articles include charts, graphs, or statistical analysis.
- » **Review articles** – critically evaluate previously published material. These articles are lengthy and are generally conducted by experienced researchers. A review article provides a summary of earlier research to inform the reader of current state of the discipline, identify relationships, contradictions, gaps, and inconsistencies in the material and makes suggestions in the next step to solving the problem.
- » **Theoretical articles** – use existing research to advance theory. The development of theory is traced in order to expand and refine theoretical constructs. A new theory may be presented, or an existing theory may be analyzed to highlight flaws or show the advantage of one theory over another. A theory's internal consistency and external validity are examined in this type of paper.
- » **Methodological articles** – new approaches, changes to existing methods, or the discussion of quantitative and data analytic approaches to the research community are presented. Readers of these articles can make a comparison of methods currently in place, and thus be able to implement the newly proposed methods.



Titles & Abstracts

The title and abstract are the most visible parts of your article. In fact, many people may never read the whole paper. It is critically important to catch the reader's attention by making the title and abstract as concise, accurate, and readable as possible. Also keep in mind how people will search for your work in a database; use descriptive key terms in both the title and abstract to enable its retrieval.

TITLE CHECKLIST

- » Aim to attract readers in 8-12 words.
- » State the main topic of your study in the title.
- » Your title should separate your article from other articles in the field.
- » Use a strong title. Make it clear and complete but succinct.

ABSTRACT GUIDELINES

- » Use an informative (i.e., descriptive) or structured abstract for research articles. Include the question/purpose, the experimental approach, results/description, and conclusion/implication.
- » Use subheadings for structured abstracts.
- » Keep the abstract short. Abstracts are typically 150-200 words in length. However, be mindful of specific guidance provided by the publisher.

KEYWORD GUIDELINES

- » Select important and specific terms as keywords.
- » Avoid words that appear in the title.
- » Avoid general single keywords that may apply to a very large number of papers.



Preparing Figures & Tables

A “picture is worth a thousand words,” right? The effective communication of information in visual form, whether in tables, graphs, photographs, or equations can aid comprehension of the accompanying text. Figures and tables should always add value. Do not restate the data shown in tables/figures in the text of your manuscript – focus on summarizing the data and the relationships that are revealed in the figures/tables or analytic results.

PRINCIPLES OF GRAPHICAL DISPLAY

- » Figures and tables should be able to stand on their own.
- » Use the fewest figures and tables needed to tell your story.
- » Design figures and tables to have strong visual impact. Remember that PNNL has Branding & Creative Services staff available to assist.
- » Present mathematics in italics to distinguish it from other text.
- » Tell the truth.
- » Help the viewer think about the information rather than the study design or methodology.
- » Encourage the eye to compare the data.
- » Make large data sets coherent.
- » Closely integrate the figure with the supporting text.

Keep in mind that the number of figures, tables, and photographs may be limited by the publishing venue and they may have very specific formatting requirements. Read the *Guidelines for Authors* carefully for guidance, to see if a graphic counts towards the total word count limits, or if there are additional publishing fees, especially for color images.



Managing Resources & Time

Often, authors write scientific papers and then consider where to publish. Identifying the right publication venue early will ensure you reach the most suitable audience, gain appropriate recognition, and avoid difficulties with publication. Conduct a literature search to identify publications that pertain directly to your research and will establish where your work “fits.” You will need to locate and acquire background materials which will frame your work by putting it in context.

Search engines such as Google are useful but by no means a substitute for a systematic review of the literature. A lit search requires that you identify abstracting and indexing databases that cover your disciplinary field. There are a variety of approaches to literature searching; these include searching by author, keyword, phrase, etc. Other approaches include cited reference searching, use of index terms, browsing specific journals, or using the snowball approach. The snowball approach includes identifying a seminal work and following the reference trail into the future or back in time. Once you have identified an important paper in your field, review the references the author cited and investigate who has cited the paper since it was published.

Being familiar with the work published in your field will not only frame arguments within your article but will help you:

- » Establish relevance – What is the current state of knowledge or practice?
- » Establish credibility – Do you know the other work that has been and is being done on this research issue?
- » Distinguish your work from theirs – How does your work differ from previous work? What are you contributing to the field? What are you correcting?

Inability to meet any of the above criteria may result in your article being rejected.



Reader Expectations

Scientific writing can be complex and difficult to digest. It is important that readers accurately understand what you as the author had intended to communicate. To be an effective communicator, you should strive to be clear and concise without oversimplifying and understand the expectations and perceptions of readers. Based on the perception of readers, it is more important to logically organize and present one's ideas than to worry about perfect grammatical form or word choice.

GOOD WRITING CHECKLIST

- 1. Write with the reader in mind.** Your collection of data cannot speak for itself. Success in writing is determined by whether your readers understand what you are trying to convey.
- 2. Use precise words.** When describing quantitative data avoid being vague by using precise details such as percentage, volume, quantity, and time intervals.

The maximum observed chlorine concentration was only a small percentage of the authorized limit. 

The maximum observed chlorine concentration was only 0.38% of the authorized limit. 

- 3. Use simple words.** Don't overcomplicate your writing.

This knowledge then provides the impetus for future research trajectories. 

This knowledge will direct future research. 

- 4. Omit unnecessary words and phrases.** Sentences will appear complex when they contain redundancies. Be as brief as possible consistent with clarity.



Reader Expectations

The fundamental premise of this manuscript is that meeting this and similarly...

~~The fundamental premise of this manuscript is that~~
Meeting this and similarly...

- 5. Limit use of abbreviations.** Use only standard abbreviations for science (i.e., international system units of measure). Define abbreviations at their first appearance, in a footnote, or both places as determined by your journal.
- 6. Use correct terminology and nomenclature.** If you are unsure about a term, look it up to determine whether or not the word should be used.
- 7. Avoid sexism.** The easiest way to avoid sexism is to use “unisex” terms (e.g., humans, they, their, or occupation titles such as doctors and nurses).

Each scientist sets his own schedule.

Scientists set their own schedules.

- 8. Establish importance.** Important information can be stressed, less important information can be subordinated, and unimportant information can be omitted. The format and structure used will lead the reader to interpret it as more important or less important.

The experiment requires these apparatuses test tube, beaker, flask, and these chemical reagents in varying quantities HCl, Fe, and H₂O.

The experiment requires
1) these apparatuses: test tube, beaker, flask, and 2) these chemical reagents (in varying quantities): HCl, Fe, and H₂O.

- 9. Placement of old, new, and complex information.** Place old, familiar, and short information at the beginning of a sentence in the topic position. Place new, complex, or long information at the end of a sentence in the stress position. If information is placed where most readers expect to find it, it is interpreted more easily and more uniformly.

Using biofilms, researchers seek to understand reactions and processes.

Researchers seek to understand reactions and processes using biofilms—groups of microorganisms that form on surfaces.

- 10. Get to the point.** Get to the subject of the main sentence quickly, and make it short and specific. If possible, use central characters and topics as subjects. Avoid long introductory phrases and long subjects.

Despite what is commonly thought to be true by the general public, our research showed...

~~Despite what is commonly thought to be true by the general public,~~ Our research showed...

- 11. Avoid obstructions between subject/verb and verb/object.**

Readers expect grammatical subjects to be followed immediately by the verb. Anything of length that interrupts this flow is often viewed as less important.

The telescope, looking for objects that register a certain brightness, will scan the area of the sky near the constellation Sagittarius.

The telescope will scan the area of the sky near the constellation Sagittarius, looking for objects that register a certain brightness. *(Writing is clearer when the subject "telescope" is followed directly by the verb "will scan".)*

- 12. Use the first person** to describe what you did – but do not overuse it, do not use it if the journal has banned it, or if the focus of the sentence should be on the organism or another topic.

The author of this paper would like to thank...

I would like to thank...



Reader Expectations

13. Use the active voice. If passive voice is used excessively, writing becomes dull and dense.

It was found that the breezes blow about 10 percent of the time.



Scientists at PNNL found that the breezes blow about 10 percent of the time. *(The active voice here explains who actually performed the verb.)*



14. Use past tense for observations, completed actions, and specific conclusions.

Example: The median concentration of cesium measured in the samples collected during this sampling effort was 0.11 pCi/g.



15. Use the present tense for generalizations and statements of general validity, including results from already published papers as these are generally assumed to be “facts.” Perfect present tense is used when observations have been repeated or continue from the past to the present.

Plants released oxygen during photosynthesis.



Plants release oxygen during photosynthesis. *(This is a fact generally recognized as true.)*



16. Use short sentences. A paper full of long sentences is difficult to follow. Aim for one main idea per sentence and aim for no more than 14 words per sentence.

Removing aluminum and chromium reduces the amount of high-level waste that ultimately must be vitrified using a complex process.



Removing aluminum and chromium reduces the amount of high-level waste. This waste will then be vitrified.



17. Use active verbs. Verbs are the most important part of an English sentence. Strong and active verbs will energize your writing. If the action of the sentence is expressed by the main verb, the sentence is natural, direct, and easy to understand.

Molecules quickly move across the surface...



Molecules whiz across the surface...



18. Avoid noun clusters. Noun clusters are nouns that are strung together to form one term. This can make it difficult to tell how they relate to one another and decipher the real meaning.

We specialize in underground mine worker safety protection procedures development.



We specialize in developing procedures to protect the safety of workers in underground mines.



19. Use clear pronouns. Pronouns are words that take the place of nouns. If the pronoun that refers to the noun is unclear, the reader may have trouble understanding the sentence.

I did not attend the rally, which was very unpatriotic. *(What is unpatriotic? The rally? Or you? It's unclear here.)*



By not attending the rally, I was unpatriotic. *(Here is it clear what/who is unpatriotic.)*



20. Use correct parallel form. Lists and ideas that are joined by *and*, *or*, or *but*, are of equal importance in a sentence and so are the ideas that are being compared. Treat ideas equally by writing them in parallel form. The reader will be able to concentrate on the idea.

21. Avoid faulty comparisons. Faulty comparisons can arise because of ambiguous and incomplete comparisons.

Oxygen proved to be a better catalyst in this experiment.



Oxygen proved to be a better catalyst than hydrogen in this experiment.



22. Edit your work. When errors occur, the reader is slowed down and may even need to reread the sentence to figure out the intended meaning. Remember to proofread and double-check your manuscript.



Reader Expectations

Let's eat grandma. *(Are you proposing to grandma that it's time to eat? Or are you proposing to eat your grandma?)*

Let's eat, grandma. *(Edit your work. The comma here makes a huge difference!)*

ENGLISH AS A SECOND LANGUAGE CHECKLIST

- 1. Use correct prepositions.** Prepositions are “little words” that link nouns, pronouns, and phrases to other words in a sentence, indicating temporal, spatial, or logical relationship to the rest of the sentence.

He forgot to consider the rise of the cost in supplies.

He forgot to consider the rise in the cost of supplies.

- 2. Use correct articles.** The English language has two kinds of articles, definite (the) and indefinite (a, an). Every time a noun is used in English, you must decide which sort of article to use, if any. Use of the article depends on the noun that follows it.

After experiment ended... *(Only use “a” or “an” if it precedes a word that begins with a vowel sound.)*

After the experiment ended...

- 3. Use correct plural and singular verb forms.**

Both of my tests is complete.

Both of my tests are complete.

- 4. Use correct form of irregular verbs.**

I sended you the results yesterday.

I sent you the results yesterday.

- 5. Do not omit endings of verbs.** Include –s, –es, –ed, or –d endings to use the third-person ending of a verb form or to express the past tense or past participle form of a verb.

I study hard last night. 

I studied hard last night. 

6. Follow a verb with the correct gerund or infinitive form.

Gerunds and infinitives add action to scientific writing. A gerund is a verb form ending in -ing and are used as nouns in English. An infinitive is the base form of the verb and is preceded by the word "to," as in "to run" or "to describe." Some verbs are followed by a gerund and others by an infinitive, and others by either one. Additionally, for certain verbs, a noun or pronoun must be placed between the verb and the infinitive that follows it.

Infinitive: I have a journal article to write before the end of the year. 

Gerund: Success is writing a journal article once a year. 

7. Distinguish between adjective and adverb. Adjectives modify nouns and pronouns and are generally placed in front of the noun or pronoun they modify. Adjectives may also be used to complement a subject and are placed following a linking verb. Linking verbs are verbs that suggest a state of being or feeling rather than an action.

The post-doc's algorithms were well. The project manager said that his work was done good. 

The post-doc's algorithms were good. The project manager said that his work was well done. 

8. Ensure that every sentence has a subject. In some languages like Italian and Spanish, the subject of a sentence can be omitted. This is not the case in English unless the sentence is imperative. English sentences, and clauses within sentences, need to have a subject even if it is as simple as "it."

Is difficult to see the difference. 

It is difficult to see the difference. 



The First Draft

Collecting data, researching previous work, organizing your thoughts, and writing all take time and energy. How do you move from doing experiments to communicating your message? Committing your thoughts and analysis to paper can be intimidating, even to the most experienced scientists. Before you begin to write, it'd be best to learn more about the writing process, the benefits of outlining, and some helpful hints for preparing your first draft.

PREPARING THE TEXT

INTRODUCTION

The purpose of the Introduction is two-fold: to capture your audience and to supply sufficient background information. This allows the reader to understand and evaluate results of the present study without needing to refer to previous publications on the topic.

The Introduction should...

- » Be short
- » Present the nature and scope of the problem(s) investigated
- » State the method(s) of the investigation, and if relevant, state the reasons for the choice of the particular method
- » State the principal results of the investigation
- » State the principal conclusion(s) suggested by the results.

Do not keep readers in suspense; allow them to follow the development of the evidence. Use strong key words and short sentences.

Content and organization generally follow two structures:

- » **Funnel** – background, state the unknown/problem, question/purpose of study, experimental approach, results/conclusions (optional), significance (optional).
- » **Descriptive** – background, discovery statement, experimental approach (if appropriate), description, implication.



The First Draft

MATERIALS & METHODS

The Materials & Methods (M&M) section is all about the details. Other purposes include providing information to let readers judge the appropriateness of the experimental methods used and probable validity of the results. Many readers will skim or skip this section. However, it is critically important as the scientific method requires that your results are reproducible.

- » For materials, include the exact technical specifications, quantities and source or method of preparation. You may need to list pertinent chemical and/or physical properties of reagents used.
- » Avoid trade names; use of generic or chemical names is preferred. However, if there are known and critical differences among proprietary products, use of the trade name with manufacturer is essential.
- » For methods, the order of presentation is usually chronological.
- » The M&M section often uses sub-headings. To see if this is suitable for your work, consult previously published articles in your target journal. When possible, construct sub-headings that match those used in the Results section.
- » Measurements are similar to cookbook recipes. If a reaction mixture was heated, give the temperature. Questions like “how” and “how much” should be answered by the author and not left up to reader interpretation.
- » Statistical methods should be used without comment; advanced or unusual methods may require a literature citation.
- » Tables and figures are common in M&M sections. (See also the Section on Preparing Figures & Tables.)

RESULTS

There are two main components of the Results section. First, an overall description of the experiments, providing the big picture without repeating what was contained in the M&M section. Second, present the data. This is written in the past tense.

- » If one or a few determinations are to be presented, they should be done descriptively in the text.
- » Repetitive determinations should be done in a table or in graphs.
- » Results are the new knowledge you are contributing to your discipline. They should be short and succinct.

DISCUSSION

The Discussion section is usually the hardest to write—and is one of the most important. Many papers are rejected by a faulty Discussion, even though the results may be both valid and interesting.

- » Try to present the principles, relationship, and generalizations shown by the Results.
- » Point out any exceptions or lack of correlation and define unsettled points. Never try to cover up data that does not quite fit.
- » Show how your results and interpretations agree (or contrast) with previously published work.
- » Discuss the theoretical implications of your work, as well as any practical applications.
- » State your conclusions as clearly as possible.
- » Summarize your evidence for each conclusion.
- » The Discussion shows the relationships among observed facts.
- » The Introduction and the Discussion should function as a pair. The Discussion answers what the Introduction asked.



Collaboration & Co-authorship

Working in teams is commonplace at PNNL. The Lab provides a dynamic array of software tools to facilitate working in and writing in groups. These include SharePoint, project shares, wikis, instant messaging, and more. Since most publishing efforts involve at least three co-authors, it can be problematic to make decisions, balance tasks, and ensure a common tone throughout the paper.

AUTHORSHIP

Listing of authors should only include those who actively contributed to the work. The order of authorship often reflects contribution to the study and writing. Typically the first author is the “senior author” who has done most of the research; senior author does not reflect the author’s status in the organization.

It is never appropriate to list someone as a co-author without their explicit agreement to such recognition.

One should NEVER be listed as an author as a favor, as a courtesy, or as an expression of gratitude. Save this for the Acknowledgments.

Publishers and scientific societies have developed their own rules and definitions for who an author is and what their responsibilities are – not only for contribution to the intellectual content of the paper but also for adherence to experimental design standards and ethical practices. Check the *Guidelines for Authors* of the journal so you have a clear understanding of authorship and their expectations. They may vary widely from publisher to publisher.

EFFECTIVE COLLABORATION CHECKLIST

- » Decide on authorship before starting to write. But be realistic as this may change due to external influences.



Collaboration and Co-authorship

- » Identify tools and resources that facilitate communication, such as wikis, instant messaging and collaborative editing. Use them regularly. More information on offered technologies is available through InfoSource, <http://infosource.pnl.gov/collaborate/index.aspx>.
- » Determine how you will manage document versioning (track changes, file name conventions, etc.). Agree on a path forward.
- » Divide work according to interest, skills, and talent.
- » Formally acknowledge any organizations or individuals who provided grants, materials, financial or technical assistance in the Acknowledgments section. If possible, specify the type of support received. In addition, acknowledge people who contributed ideas, information, critical writing, or editing of your work.

Keep the above checklist in mind as you develop project plans, carry out your research, and write up your results. Don't forget, NSD Technical Communications can help your team make tone and style consistent. Be considerate of your co-authors and share the load!

NOTES:



Reviewing & Refereeing

A key component of the scientific publication process is peer review. Peer review is a formalized way to assess scholarly works. Typically two or more referees comment on the quality, originality, and importance of the research. It is very common for their identities to be anonymous. Their feedback is used by the editors of the publication to make a publication decision, and by the authors to improve their paper.

The peer review system ensures that only credible, high-quality research is published. It improves the quality of published work and ensures that readers can trust a journal to provide reliable information. During your career you may be asked to serve as a peer reviewer. This provides you with an opportunity to stay up to date on progress in your field and to see new and innovative research before it gets published.

Peer review is used widely throughout the world and across disciplines. The exact requirements for reviewing and refereeing may vary slightly from journal to journal. However, the main aim is always to improve the paper and assure the quality of the research.

PEER REVIEW CHECKLIST

- » Is the technical approach adequately described?
- » Is the methodology sound and replicable?
- » Are the data and analyses well supported and appropriate for the conclusions drawn?
- » Are there obvious errors of fact or logic?
- » Is there appropriate acknowledgement of the work of others?
- » Is the writing at the appropriate professional level for the intended use?



Final Version & Submission

As you progress in your writing and address internal reviewer comments, prepare yourself for what comes next – submitting your work.

First impressions count. Write a cover letter to accompany your journal article submission (not necessary for conference papers unless stated in submission guidelines). It establishes your credibility, ensures the manuscript is seriously considered for publication, and it initiates a positive rapport with the editor and editorial staff of the journal.

FINAL CHECKLIST

- » Write a cover letter.
- » Make sure all authors listed on the paper have seen the work, have been provided the opportunity to comment, and approve the paper's content.
- » The name of the author designated as corresponding author, along with an email address, postal address, telephone, and fax numbers are included.
- » If required, all author data should appear on a separate page to facilitate anonymous peer review.
- » An abstract and keywords are provided.
- » Biographical sketches of the authors are included if requested.
- » An acknowledgment to your funding agency and/or supporting organizations and staff is included.
- » Pages are numbered in sequence.
- » Use spell check.
- » Hire a technical editor and/or graphic design specialist for a professional look and feel.
- » References are in the correct format.
- » All references mentioned in the reference list are cited in the text, and vice versa.



Final Version & Submission

- » Permission has been obtained for use of all copyrighted material from other sources (including your own work published elsewhere).
- » All tables and figures have captions.

And finally, never, ever, submit your work to more than one journal at a time!

ACCEPT, REVISE, REJECT

After you have submitted your article and have received feedback from the reviewers, you will need to address any revisions requested. If there are fundamental flaws, rewrite the manuscript. If some points are valid but others not, rewrite and incorporate suggested changes, make additions or clarify the points which the reviewers took exception to, resubmit with a cover statement indicating point by point how the reviewer comments were addressed. You always have the option to withdraw the paper and resubmit to another journal if the venue is not appropriate.

YOU'RE PUBLISHED, NOW WHAT

Once your paper is accepted celebrate your success! After it has been published in print or online remember to update the entry in ERICA (your group administrator can help with this process).

Publication cycles vary wildly. The average journal article takes six months from acceptance to publication. However, some venues may take anywhere from twelve to twenty-four months. While you're waiting for your paper to be published, start work on the next one!

NOTES:



Best Practices

Writing doesn't come easy to most of us. It takes concerted practice, regular exposure to the literature, and a desire to participate in the scientific community.

CHECKLIST FOR PUBLISHING SUCCESS

- » Read a lot. Stay current. Make technology work for you. Get journal table of content alerts through journal RSS feeds, email alerts, or install the journal's mobile app, if available.
- » Ask for help. Call in the experts to alleviate some of your workload. These can be librarians, technical writers and editors, graphic designers, and more!
- » When looking for a place to submit your work, search for the best match of journal scope and audience.
- » Obtain *Guidelines for Authors* and follow them.
- » Decide on authorship before starting to write.
- » Start by writing less. Outline and use bullet points to get thoughts out of your head and onto paper.
- » Organize your ideas and data before writing.
- » Use software like EndNote® to manage citations and make citing references easier.
- » There is always something that is more important than writing. You must make writing a priority. Carve out 30-60 minutes every day.
- » Never, ever, submit the same work to multiple venues.

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