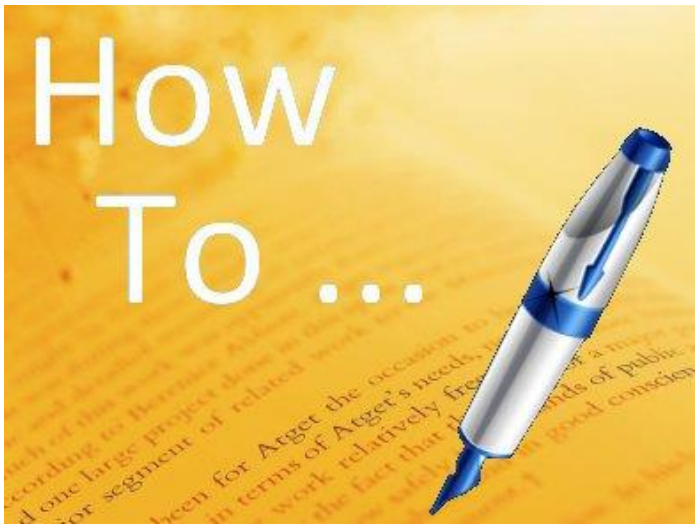
Paper Writing

Further reading:

Tips for Writing Better Science Papers

By Richard Threlfall, 2012, Asian Journal of Organic Chemistry/Wiley-VCH



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Education: Introducing the European Young Chemist Network (EYCN)

Have you ever struggled to write up your results into a publishable paper only to get it rejected? Richard Threlfall, Managing Editor, Asian Journal of Organic Chemistry, gives some insider tips on how to improve each section of your article and increase your chances of getting published.

Contents:

How to start

There are definitely many ways to start a manuscript. Here is my personal favourite:

- **Collect your results**, make Figures, Schemes, and Tables
- Try to make a title (**working title**)
- Think about the list of **co-authors** and collect their affiliations
- Choose a **journal** and check for the **formats**. Write down: Title, authors, affiliations, and the section titles.
- Start with the **Experimental Section**
- Then go to the **Results and Discussion** and fill in all Figures, Schemes and Tables. Check if you need more of them. In this first version you write what you did and compare your data internally.
- Then write the first version of **Conclusions** and **abstract**
- Check now the **title** again
- Now, you start **searching** in the web and databases for relevant information (previous reports, papers, reviews) and start writing the **Introduction**. Now you get the **research idea** (why you did this research). You place this idea at the end of the Introduction.
- Then you start re-writing the **Results and Discussion**. Now you compare your data with data from others and with your research idea. You also complete the **reference list**. Eventually, you re-organise this section in view of the research idea – you have to tell a story!
- Generate a **Supporting Material/Information** file and move less important Figures, Schemes, Tables to this file.
- Re-write **Conclusions and abstract**, making sure that they are not very similar.
- Check the **title** again.
- Add all necessary information on **funding** and **acknowledgements**. Some journals request a list of **Author Contributions**. Check for all this at the journal's webpage.

Choosing the right journal

The choice of the "right" journal is difficult with several conflicting lines:

1) You want (or you must) publish your manuscript in a high-impact journal.

2) High impact journals have high rejection rates (30-90%) and require high quality contributions.

3) You want to make your manuscript visible to the community (as fast and as good as possible).

These are probably your ideas about this. Let's see how you can approach the problem:

- Find one or more **suitable journals**. Read the journal information, if they really cover your topic.
- Check for the so-called **impact** (this is a very critical number and in many cases on the edge of meaningless).
- Check the **quality of** contents and presentation of **your manuscript** to get an idea in which journal your work might be accepted (don't bet to high, it will just cost you time and bring you frustration).
- Finally, make the best out of your report. Since your data is, as it is, you can **work on the presentation** to make your manuscript tremendously better.

The submission

Importantly, the **order of chapters/paragraphs** is usually given by the publishers/editors and should not be changed.

To check this and other formats, **download a recent example** of an article from this journal. Submission of the manuscript is frequently in the form of a **complete manuscript with embedded figures, schemes and tables** – ideally use the provided **templates**.

Editors and publishers might as well accept non-templated complete manuscripts or even manuscript with the text separated from Schemes, Figures, and Tables which were provided at the end of the manuscript. For reviewers the latter form is rather unpleasant and should thus be avoided.

The Cover Letter

The cover letter is extremely important as the editor first decides whether to send the manuscripts to expert-reviewers or not (**editor rejection**). Therefore, you have to convince the editor in the letter.

Furthermore, since journals have different ideas about the quality of contributions, you have to convince the editor, that your manuscript has the necessary quality for publication in the journal XY (**justification**). Nevertheless it should be short and not exceed a full A4 page.

Threlfall writes:

Dear Editor,

Compound X has interesting biological and pharmaceutical activity. We made some improvements over a previous synthesis and believe it has wider applications in organic chemistry.

Sincerely

A. Author

A letter like this poses more questions than it answers for the editor. A better start might be:

Compound X is a potent anticancer agent. However, up until now, it could only be isolated in small amounts from Plantius planticus. Our total synthesis gives compound X in 99% yield by …

or

We have synthesized catalyst A, which is 75% more efficient than catalysts B and C for the industrially important hydrolysis of Y. This improvement in efficiency is caused by …

The Abstract (see below)

Size might be limited (check in submission details by the journal).

The Manuscript (see below)

Submit as word or pdf document

Supporting Material

Comprehensive work might contain a lot of material. It is advisable to move big parts to the Supporting Material to keep the manuscript small.

Additionally, complete experimental details and further figures, tables, and schemes might help the interested reader and help to reproduce experiments.

Since the **Supporting Material** can be downloaded from the same site as the manuscript, the material **is an integral part of the paper**.

List of potential reviewers (and editor)

During the submission process you will be asked for **potential reviewer** (at least three), reviewer which should be excluded and the editor (regional or topic editors).

With choosing the reviewers you can show your **knowledge of the field** and you can avoid reviewers with which you had bad experience. The same is true for the editor.

The **search for potential reviewers** starts in your manuscript. The authors in your reference list are potential reviewers, those who are not in your reference list are either no experts in the topic – or you forgot to mention their work. In this case, it is advisable to check the manuscript again if it really covers the state-of-the art and the most important researchers in the field.

Author list with full affiliations

During the submission process you will be asked for a **complete list of the authors** including full **affiliation**, the order of the authors. Importantly, you have to submit **email-addresses** for all authors, since the editor will contact them about the submission and the further procedure. Make sure, these email-addresses are valid.

Funding

Information on this must be provided.

Conflict of Interests

Information on this has to be provided

The Manuscript

Before we start, I have some general remarks on how to design and compose a manuscript. There are two ways of preparing a manuscript:

A) using a **journal template** or B) **normal text on A4 pages** with normal margins.

For B): For the first drafts, make the format very simple, do not even use the Microsoft formatting. My favourite: "Standard" Microsoft formatting, Palatino linotype 10, line spacing 1.5, no top – no bottom spacing, justify.

- Only use the journal **formatting of headlines** and sub-headlines by increasing the font size and maybe bold or italics. To separate paragraphs use small **indentations**.
- Decide whether you want to write in **British English** (colour, behaviour, analyse, ...) or **American English** (color, behavior, analyze, ...).
- Use **correct terminology** and check for the **most frequent/accepted** terms. Refrain from coining "fancy terminology" or using recently coined "fancy terminology" = **buzz words** to make your report more important. This is not serious science.
- Please be careful in **which part** you want/need to **place specific information**. It is not adequate to repeat e.g. technical information in the Experimental and the Results and Discussion (R&D) part. Also, there must not be introductory things in the R&D part.

Title

Titles must be short, informative (not only to the specialist), and CATCHY. Take your time and carefully think about the title word-by-word.

Threlfall*: The title of a paper is important because it is one of the first things that an editor/reviewer/reader sees when they look at your manuscript. Therefore, it is important to grab their attention right away and give them an idea of why your paper is a scientific breakthrough! Be specific, not too technical, and concise.*
The other thing to consider is that internet and scientific search tools often search by manuscript title, so if you want to get your paper read and cited, it is important to get some of the key aspects of the research into the title. A good tip is to think which search terms you would use to find your own paper through a web search.
For a basic example, consider a (fictional) manuscript entitled "Effect of Metal Catalyst on the Outcome of Reactions with Aryl Alcohols".
What is the effect? Which metal? What reaction? What type of aryl alcohols? The editor/reviewer/reader get nothing but questions out of this title!
Much better might be: "Ruthenium Trichloride is an Efficient Catalyst for C–H Activation with 2,4-Disubstituted Aryl Alcohols".
The editor/reviewer/reader immediately knows what the paper is about and will want to read more. Plus, someone who types in terms like "ruthenium", "C–H activation", or "2,4-disubstituted" into a search engine has a much higher chance of finding the second manuscript, but does not get any matches with the title of the first one.

Author list with affiliations

Only authors with an **important contribution** should be on the author list.

The **order of authors** is a matter of the specific discipline; in chemistry it is usual to put the main contributor to the first position. This is often the PhD student who did the experimental work. The supervisor is frequently found in the last position.

The asterisk * marks the **corresponding author(s)** (main intellectual contributions and for queries, thus this is usually the supervisor).

Author IDs: a) **ORCID** (Open Researcher Contributor Identification Initiative); b) Web of Science ResearcherID; c) Publons, …

Abstract

The abstract must be **short** and should **attract the reader's attention** with the **first statement**, which can be of introductory nature. Then add a few of the **most important results**. Here you should be

specific: e.g. don't write that you have measured XRD, but write about the XRD results; if they are important, even in detail). Maybe leave an **overall message** of the manuscript in the **last sentence**.

- Avoid to copy-paste the Conclusions. Conclusions and abstract have very different functions.
- For some journals the length of the abstract is limited. Check this before submission.
- Electronic **search engines** as Google or Scifinder and indexing services as ISI or ISC will often only search abstracts when performing **word-based** searches, and the abstract is frequently the first thing that is displayed when your manuscript appears in searches. From this point of view, you should make sure that they find **suitable keywords** in the abstract as well as the title to give your manuscript the best chance of being found by a search.
- Use **correct terminology** and check for the **most frequent/accepted** terms. Refrain from coining "fancy terminology" or using recently coined "fancy terminology" = **buzz words** to make your report more important. This is not serious science.
- Normally, the abstract does not contain references.

Threlfall*: Imagine you have twenty seconds to explain the project you have been working on for months or years to another scientist who is not familiar with your area of research. You would probably try and tell them the one or two main outcomes without going into excessive technical detail. This is a good way to think about writing your abstract!*

Keywords

The number of keywords is usually given by the publisher/editor. Usually it is 5–10. Frequently, there is a list from which you can choose keywords. If not, thing it carefully over, indexing in ISI and ISC will be also made according to these keywords.

Introduction

The introduction must be **brief** (not more than the first page in two-column template or max. two A4 pages in a one-column manuscript including schemes and figures). Don't extensively use figures and schemes.

At the same time the introduction must be presenting the **state-of-the-art of the topic** and the **research question** of the manuscript.

Motivation for a work is important, but not in a journal publication. Refrain from writing "why and how you want to save the world". It is e.g. enough to write: "In view of the challenges of transforming energy production from fossil to renewable resources, the development of efficient catalysts for the hydrogen evolution reaction (HER) is of pivotal interest".

The introduction usually requires **careful literature research**, since it must be clearly pointed out if something **similar or very similar** to the reported material in the manuscript has ever been published or not.

Figures or Schemes might be helpful, but do not use reproductions from old papers.

The writing should be strictly hierarchic:

- Starting with very general things. This takes ideally only one sentence maybe two and 1–10 references (mostly reviews). This part might even be omitted (see Threlfall).
- Then you **specify the topic** e.g. the general compound class or type of measurements (max. 5 sentences; 5–15 references, essentially reviews).
- Then you come to the **specific compound class** or very similar, previously reported compounds (5–25 references) or **studies**. This also includes **your previous work** on the topic.
- Thus, the introduction reaches the part in which the **research question** is presented and some details, e.g. the compounds of this study. This section starts usually with something like: "In this contribution, we report on ..."
- Finally, use **correct terminology** and check for the **most frequent/accepted** terms. Refrain from coining "fancy terminology" or using recently coined "fancy terminology" = **buzz words** to make your report more important. This is not serious science. If a term is frequently used, but not generally accepted, you can introduce this term, if you really need it for scientific reasons.

An example: "... can be divided into 1D, 2D, or 3D coordination polymers [1-14], including the porous 3D metal-organic frameworks (MOFs) [1,2,4-8], cyclic oligomers or clusters [8-17], complexes or complex salts, frequently also called "0D" materials [18-22].

Threlfall*: Many manuscripts begin with generic statements like:*

"X structure is ubiquitous in natural products and it is also important in medicinal chemistry."

This may be true, but does it grab the attention of the reader? Why is structure X important in medicinal chemistry? Which natural products can this structure be found in and why does that matter? What does structure X do that structure Y doesn't? Setting the scene well for your reader is vital so that the reader knows the importance of your research. However, try also to avoid making claims that are too bold, like "this is a potential cure for all cancers" (unless it really is, then you really can shout about it!).

A good thing to avoid is making your introduction into a minireview. There is a huge amount of literature out there, but as a scientist you should be able to pick out the things that are most relevant to your work and explain why. This shows an editor/reviewer/reader that you really understand your area of research and that you can get straight to the most important issues.

Many people start with a broad statement and then narrow the subject matter down gradually to their specific area of interest. This is not necessarily wrong, but why bother discussing things that are not really that relevant? For example, if you are writing about C–H activation, avoid sentences like:

"C–H activation has been heavily studied in the past decade.[1-12]"

Then include massively diverse examples of C–H activation in references 1-12. Everyone knows that C–H activation has been intensively studied and there are thousands of examples of it. Better is to draw the attention of the reader to exactly the question you want to answer in your research. Consider instead:

"Among many examples of C–H activation, such reactions at the C5 position of X compounds have not been extensively studied. This is because ..."

In this example, you begin to show your knowledge of the literature and your research straight away in one or two sentences. A great impact!

Graphics and Tables

Graphics, Tables, Equations ...

- First, think about what to call a **figure**, what a **scheme** or **chart**, what a **table**. Usually spectra and related things are figures, ChemDraw sketches are schemes or charts. Mathematical equations are placed as **equations** with numbers. Tables should contain comparative information (more than on line or one column).
- Either use Figure 1 or Fig. 1, the same for Eq. 1 or Equation 1. This depends on the journal. Don't use Fig. 1 as an abbreviation for Figure 1 in the manuscript.
- Think about the **size and resolution** of the content. The final size is often max. 8 cm in width in a double-column format. Journals do not like very much double column figures but they accept them.
- Don't use extensively **text** in the figures and schemes. There is room in the figure caption for this. Take care for the **completeness, correctness and size of axes descriptors** or other **labels**. My default is arial 28 points (e.g. when you do figures in Origin).
- Use **colours** if helpful for the reader, but do not colourise everything because you love colours. Keep in mind that some people might use black and white copies of your paper.
- Schemes and figures have **following captions**, while tables have **headings and footnotes**.
- **Table 1**, **Scheme 3a**, **Figure 8b** are **names**, thus written in **capital letters**, otherwise schemes, charts, and tables are simple nouns.

Graphic and Table captions and footnotes:

Make sure, that a **graphic and a table can be understood without reading the text** by adding all important information to the captions. This is not easy since the captions should be short at the same time.

For spectra and other experimental plots, the **most important information** on sample, solvent (or solid), T, frequency etc. must be provided. E.g. 400 MHz ^{1}H NMR spectrum of XXX in acetone-d_6.

Some journals accept **larger captions**, e.g. selected bonding parameters of a molecular structure from single crystal XRD.

For the **formatting of headings, captions and footnotes**, check the journal. Frequently, the fonts are smaller (but the same), sometimes the line spacing is smaller (1.0) but **NEVER** is the formatting in **italics**.

Graphical abstract/Pictorial:

All journals request a graphical abstract/pictorial for their **table of contents**. The picture should make a **highlight** of your report (one or two most important aspects), not a summary. To get a good **resolution and visibility** consider a 1-column sized 9x6 cm image in your manuscript and a resolution of min. 300 dpi. At this size you should be able to read all scales and words and get the information.

Results and discussion

This is the heart of the manuscript and it **defines the quality** of a paper as a research report. After the complete experimental work has been put down in the Experimental Section you can focus on the most important things and move the rest to the Supporting Material. Make your Research and Discussion (R&D) Section concise.

- When starting to write this section, think about the **levels of sophistication**. Start with **description**, Figures, Schemes, Tables → go to **comparisons** within your own data → compare your data to those of **previous reports** → **discuss** the results in the light of **your research idea** and finally in the light of established **concepts, models, and theories**.
- Keep in mind that the R&D and the experimental sections are different. There is usually **no** need to discuss **experimental procedures in the R&D section** unless the practical aspects of the work have some important effect on the outcome of the experiments. For example, if the order of reagent addition alters the yield or the reaction pathway, this should definitely be part of your discussion. If not, leave it to the Experimental Section.
- Use **abbreviations** sparingly and consistently throughout your paper. Define an abbreviation where it is first used and leave it at that—it is not necessary to re-define abbreviations in every new section. Usually, you don't need to define the simpler things,

such as NMR, AFM, or HPLC, but make sure you do define abbreviations of chemical names.

For finding the correct names for chemicals or methods, refer to the IUPAC colour book:

- Chemical Terminology (Gold book)
- Quantities, Units and Symbols in Physical Chemistry (Green Book)
- Nomenclature of Inorganic Chemistry (Red Book)
- Nomenclature of Organic Chemistry (Blue book)
- Compendium of Polymer Terminology and Nomenclature (Purple book)
- Analytical Nomenclature (Orange book)
- Compendium of Terminology and Nomenclature of Properties Clinical Laboratory Sciences (Silver book)
- Biochemical Nomenclature (White Book)
- Principles of Chemical Nomenclature

Think carefully about abbreviations. Some are not necessary as chemical formulae are informative enough: H_2, MeCN, CH_2Cl_2, $CDCl_3$, etc. The same for current abbreviations: EtOH, *i*PrNH$_2$, etc.

Abbreviate atom names and isotopes: ^{1}H, Pt(II), Hg atoms, ... Think about the proper description of oxidation states: Fe(II) or Fe^{II}, protons or hydride (instead of H atoms), ...

The use of the longer hyphen/dash allows assigning specials things like bonds: O–H, hydrogen bonds: Cl···H–O, excited states: π–π* and as "minus": –2.3 V or 1245 cm^{-1}, but don't use it as normal dash e.g. in electron-rich.

Greek symbols such as π-accepting, σ bond, α, κ^2, λ, but also → or × can be introduced in the same font: INSERT – SYMBOL. Very specific symbols are found in other fonts: ≡ or ⇆.

Threlfall*: Focus on the really important bits, not the very small details—especially if you are writing a communication and not a full paper. To put this into a simple example, if you've tried a reaction in several different solvents, you don't need to discuss every single experimental result with every single solvent. Put all the data in a table, and perhaps you could comment on a general trend, such as polar versus nonpolar, and discuss why the best solvent is the best solvent in this particular case. Going through each individual result in the table is usually unnecessary.*

Sometimes, the most interesting and discussible parts of research are the anomalies or the things that don't make sense. Don't ignore these outliers because referees will likely ask you to comment on your strange results. Discussion of strange results is often as valuable as focusing on the expected findings, as it can help in understanding the more subtle features of a reaction, a catalyst, or a material. And who knows, your one weird result might just be enough to open up a whole new area of research!

Conclusions

- The Conclusions should be concise and tell again the **essential findings**. It is more important to stress the **highlights** than to present the full information again.
- It is a very suitable place to **compare your research idea** with the **outcome** of your study. Eventually, present **future ideas** here.
- It must not be a repetition of the Abstract (reviewers find this boring).
- The Conclusions should stand alone if possible, maybe the reader (or the reviewer) reads only this section, and then he or she should get the idea about the paper.

Threlfall*: There's an old saying when making presentations: "Tell them what you're going to tell them, tell them, then tell them what you've told them". Whether you like to use this format or not for your talks, it doesn't take a great leap of logic to see that the basic structure of a paper could also look a lot like this. "Tell them what you're going to tell them" would be the abstract and introduction, "tell them" is the results and discussion and experimental, then "tell them what you've told them" is the conclusion.*

In a talk someone can't easily refer back to what's gone before, so it's not a bad idea to recap the main ideas at the end. But in a paper there's not much point in just repeating bits that can be easily found a few paragraphs above. Therefore, the conclusion section should be much more than just restating the results, and you should aim to bring together your initial ideas, the results that you've now got, and how existing knowledge now has to change because of these results.

A conclusion section doesn't have to be too long and six to eight sentences should probably suffice for most papers. A summary of the main results is a good place to start but it's not necessary to include much data unless you can pick out one or two key data points that really highlight what you've discovered. Next you should briefly discuss whether or not the results you obtained are what you expected, and if not, why not? Do your results give you any insight that may be applicable to the wider field of research? Do they pose questions about a current theory or do they further confirm existing ideas?

Lastly, now you've got the results that you have, you should say something about what you're going to do next. A lot of papers end pretty weakly with a statement like: "The applications of this method are currently under investigation in our laboratory." While that may be true, it's much better and much more interesting to be specific. What exactly are you going to try to do next and what about your current results makes you think you'll be successful? What do you expect from future investigations and are there any hints in the current study that there may be some unexpected twists further down the road?

Remember, the conclusion may well be one of the last parts of your paper that a referee reads, so you should aim to finish on an inspiring note. Instead of just "telling them what you've told them", show them how you've

changed the way scientists should think about this area of research, that you've already figured what's to follow, and that you can't wait to get going on the next challenges!

Experimental Section

- This is always the first section to start with and it is very important. It must contain all material which is discussed in the Results and Discussion section.

Threlfall*: Don't forget, this is the evidence for all of your ideas presented in the paper and there are people who will use or try to reproduce your methods. Therefore, clarity and good presentation really helps.*

Two good tips are to avoid repetition and to be consistent in the way you present your data. Repeatedly stating reaction conditions, amounts used, or analytical techniques doesn't add very much to the paper and makes the important things harder to find. A summary of general procedures, analytical techniques, and other relevant details in a "general" section at the beginning of the experimental is a great tool for avoiding unnecessary repetition.

- The format requirements are usually given by the journal.

Consistency in data presentation makes the experimental section easier to use when it comes to peer review. Check the author guidelines and previous issues of the journal you are submitting to for how to format your data. Remember that most journals only require the analytical data for compounds that are new to be disclosed in the experimental section, but check the author guidelines first.

- Care should be taken when writing, editing, and checking the Experimental.

Reviewers will often highlight or question inconsistencies in experimental data as things that should be examined further, when in reality it is just a typo or something left over from a previous version of your manuscript. Therefore, presenting your data clearly and checking it thoroughly before submission is well worth it to avoid unnecessary rounds of revision and review.

- Safety considerations: In some journal safety considerations or safety instructions were requested for selected (hazardous) compounds. You should obey to these requests.

References

- There reference management programmes like endnote. I do not recommend them. If you want to use them, don't be lazy in keeping your entries faultless.
- Quite generally, the references help you to set the stage in the Introduction and they help to discuss your results.
- At the same time, the proper choice of references (enough but not too much) shows your expertise to the field. Review articles allow neglecting previous important work but making sure this work has been cited in these reviews.

- Don't be closefisted, citations are an important currency in science.
- When choosing the reviewers, check carefully if he or she has wrote something important to the field recently.
- The References should be formatted according to the journal rules. Carefully check the completeness and correctness of the references. This is important for citations and reviewers might get a bad impression about your trustworthiness if the reference list is slipshod.

Threlfall: *Especially when referencing the introduction of your manuscript, a good tip is to only reference the most relevant papers or some good thorough reviews on your particular area of research. Perhaps you might not think about it, but this shows the editor and the reviewers that you have a good knowledge of your field and really understand what is important in this context.*

As a basic example, using a statement like "C–H activation has become increasingly important in recent years [1]", then giving 25 different examples of C–H activation in reference 1 is not very helpful. Unless it is really necessary, these broad statements do not add much to the understanding of the concept being discussed and are best avoided.

Good reference management software can help a lot with your reference section. A good reference management program will ensure consistency in your numbering of references, will let you apply different styles from different journals, and will automatically update the references throughout the manuscript when it is modified, to help avoid confusion. Some of these packages are available as web-based apps and are well worth investigating. Finally, make sure that your reference section is up-to-date. A reference section that does not have many recent publications in it tells an editor or reviewer two things: 1) This area of research is not very modern and 2) This author does not have a good knowledge of the current literature. When you think about it this way, your references can have a bigger influence on the outcome of the review process than you might realize!

Acknowledgements

Funding

Conflict of Interest

Acknowledgements for minor contributions

In some journals Funding and Acknowledgements is one section. In the submission process, the Funding has to be provided.

Author contributions

Nowadays journal require a list of individual contributions of the authors. To keep this short, download a recent example of the journal and write this part in the same way.

What Happens Next?

The reviewing:

Threlfall: *The things that editors and reviewers look for can be summarised in four points:*

1) Innovation – What does this manuscript offer that I can't find elsewhere?

2) Hypothesis – Is there a good reason for doing this work? What question does it answer?

3) Evidence – Does the data and the explanation support the conclusions?

4) Writing – Is the manuscript well written? Do I have to work hard to understand the main results?

First of all, an editor/reviewer will read the title. This sounds like a basic thing, but titles make the first impression. Is it interesting? Is it informative? Does it show that this paper makes an impact in the particular field of research? Does it engage them and get them reading the rest of the paper? A common criticism from referees is that the title of a paper doesn't match its contents, so watch out for this.

The next thing that will be considered is the overall concept of the manuscript. How does it fit with what is already known? What advances in knowledge does it offer? What is innovative about this work? Is it controversial or are the results unexpected? If you are discussing a new concept or something that is likely to be controversial, it is advisable to explain the context of your research very carefully. In this case, consider spending a bit more time on your introduction. This way you give the reviewer all of the background information and you might highlight something of importance which they hadn't thought of or weren't aware of themselves.

Reviewer's comments – and how to cope with them:

Do your best in this part! **Consider any points** raised by the reviewers and revise your manuscript accordingly and **thoroughly**. If a reviewer points to some inconsistency in formatting in one paragraph it is your job to search throughout the manuscript to correct all of these things in all paragraphs. Refrain from fixing just the minimal things and those explicitly mentioned by the reviewer. **Work carefully through the entire manuscript**, so the reviewer can see that you are interested in the quality of your paper and not only in getting it published with the least effort. A good revision will **improve the overall quality** of your paper.

- **Rule No. 1 – the reviewer is always right.** No joke, he or she is the expert, he or she has done this many times, he or she has not the slightest interest if your paper is published or not. The reviewer is only interested to do a good job for the journal and for the quality of science in general and he or she is not paid for this.
- Try to **understand the reviewer's viewpoint** and change the manuscript accordingly (even if the reviewer's suggestion doesn't make the manuscript better in your view). Imaging that if

something is not clear to the reviewer, it might not be clear to other readers. So, provide more information or make the text more informative.

- You have to write a **point-by-point response letter**. Do not discuss with the reviewer in this letter, nor try to convince him or her supplying further information.
- If you **disagree** with one of the points raised by the reviewer **do not discuss/argue** with the reviewer in your responses. Instead, revise the text in a way to make the points more clear and state this clearly in the response.
- If you **absolutely disagree** with one of the points, you can oppose this reviewers comment. But you have to have **very important reasons** to do so. Explain your opinion briefly, but **avoid aggressive arguing** with the reviewer.
- If you are convinced that the review was **unfair**, you can write a **rebuttal letter** to the editor.

Finally, this though might help: You are at an early stage of your career. Therefore, it is very likely that the reviewer is more experienced and has more knowledge of the field. It is thus generally not wise to argue with the reviewer or write to the editor. If you are getting older and more experienced you will write better papers and this problem will largely disappear.

Threlfall*: Once the editor or reviewer understands the concept of the manuscript, they will, of course, examine your results and the experimental evidence for your claims. Reviewers are not unreasonable with their expectations for experimental results, as long as you explain them well. As a basic example, if the yield of a reaction is 50%, then you should explain what happens to the other 50%. Even if it is as simple as a difficult work up and you show that you have taken reasonable steps to optimise the yield, this is fine. Your aim should be to avoid the reviewer asking questions like "I wonder why they didn't try X?" or "Why do they need to use 20 equivalents of that reagent?".*

Editors and referees will check that your experimental data and supporting information is consistent with your claims, for example, with structure assignments. Missing characterization data is another common criticism from referees, so double check that you have included everything required. Also consult the journal's author guidelines for their requirements with respect to characterization data. Referees are good at finding even very small inconsistencies in analytical data, so don't ignore them if they are there. A reasonable discussion of anomalies in data, even if you have ambiguous data, is much better than ignoring it completely.

- Frequently, reviewers complain about your **English**. Don't take it personally; take it as a chance to improve your English writing.
- It is important to understand that the **clear presentation** of the results **makes the quality** in the same way as the results themselves.

- Considering the usual **quality scale of journals**: a) top 10% (very important); b) to 25% (important); top 50% (routine), and below (not acceptable) your manuscript can make the step from c) to b) and will be accepted. Or it steps from b) to a) and will be promoted by the publisher. And all this simply based on the **quality of your presentation**.

Threlfall*: Finally, if you are submitting a paper in English, try to have it proof-read by a native speaker if possible. There are also professional manuscript editing services available that will do the same, but you will have to pay to use one of these. Checking the language is just as important as checking the scientific data because even if you have the most revolutionary data that the scientific world has ever seen, if the editor or referees can't understand it they are unlikely to appreciate its significance.*

Remember, you have the best knowledge of the research that you have done – this makes you the expert! Things that are obvious to you may not be obvious to someone else who has not spent so long working on them. Therefore, it is up to you to explain your research thoroughly and clearly so that the editor or reviewer knows how important it is. Explain as completely as you can and try to leave no questions unanswered!

See further points on Rejection and Revision below.

Scientific English writing

When it comes to language, style, and grammar, it gets difficult for non-English speakers. Just a few simple ideas to this:

- Use **correct terminology** and check for the **most frequent/accepted** terms. Refrain from coining "fancy terminology" or using recently coined "fancy terminology" = **buzz words** to make your report more important.
- Don't use daily language – then your mother tongue will talk. **Write in scientific language**, this will facilitate the English. Do the same in presentations.
- In **Poetry** it is important to vary the words and words can have many meanings. At school we learn that we shall not repeat words over and over again. In **Science,** one term has **one meaning** and therefore must eventually be repeated. Usually there are **no synonyms** for scientific terms. Homonyms (words with several meanings) are hell and must be banned from scientific texts.
- **Don't use pseudo-synonyms** proposed by Google and Co. not even for normal words! It is no problem to repeat words or phrases, such as "show". Already "exhibit" sounds a bit artificial. Rather rewrite the sentence. If you really need a synonym, ask your colleague in the field who is a native English speaker. There are usually one or two acceptable synonyms for words as

"synthesise" = "prepare", and "have" and "owe", "bear" and "carry" can be used as synonyms. But remember, you are not writing poetry but a very formal scientific text.

- Write **short sentences.**
- Take some effort in **re-phrasing your text**. English is also usually shorter that other languages. So, if you do this properly, you get two improvements at the same time.
- Do not copy parts of texts of a paper, this is plagiarism, but you can **copy the format and writing style**, e.g. of an Experimental Section.
- **Improve your English** writing by reading more papers of native English speakers. Try to find the typical pitfalls of your mother tongue (for us Germans, we call it "Denglish").
- Talk with an (imaginative) guest, colleague or supervisor **about your research in English**, and use English terminology.

Threlfall: *Mind your Language! A Very Brief Guide to Language Usage in Scientific Writing*

- This is some kind of course by Threlfall. You can try to follow it.

Simplicity is the Key

I'm going to start with a citation which really underlines the point behind taking care of what you write: D. Oppenheimer, *Appl. Cognit. Psychol.* **2006**, *20*, 139–156. *DOI: 10.1002/acp.1178*

To save you scuttling off to the library website, this study, aptly titled "Consequences of Erudite Vernacular Utilized Irrespective of Necessity: Problems with Using Long Words Needlessly", showed that the perceived intelligence of authors is INVERSELY PROPORTIONAL to the complexity of the language used in a piece of writing. Yes, that's right, use more complicated words and people may not think you are as clever as you say you are.

Perhaps this is a case of blinding with science, or maybe people think that gaps in knowledge are filled with clever words instead. Whatever the reason, explaining the most complicated of scientific principles in simple and understandable language is a valuable skill and all it really takes is a little bit of thought about the words you use to avoid repeating the mistakes of the past.

The scientific literature is awash with complicated words and sentence when simple ones would do just as well. Consider the following sentences from a hypothetical conclusion:

"Functionalized polythiophene compound 1 exhibits attractive electronic properties and shows fluorescence due to functionalized polythiophene 1 possessing a benzyl group at the C5 position. This synthetic methodology represents both a significant advance over previous reports of functionalized polythiophene compounds and opens new avenues towards developing novel photoexcitable oligomers."

Although this is not a real example, it is a fair approximation of the content of many manuscripts that are published, even in the top science journals.

See if you can identify some improvements

There are at least 12 opportunities to simplify the wording if you think about the meanings and context of the words carefully. It is easy to make considerable improvements in a very short time.

Functionalized polythiophene (compound) 1 (exhibits) attractive electronic properties and (shows) fluorescence (due to) (functionalized polythiophene 1) possessing a benzyl group at the C5 position. This synthetic (methodology) (represents) (both) a (significant advance over previous reports) of (functionalized polythiophene compounds) and (opens a new avenue towards) developing (novel) photoexcitable oligomers.

Let's take a look at the parts in brackets in order that they appear:

compound – stating the obvious, can be omitted.

exhibits – is this an art gallery or a chemical compound?

shows (fluorescence) – to who?

due to – only for concepts of time, where something is due to arrive, happen, and so on.

functionalized polythiophene 1 – unnecessary repetition is common and unnecessary repetition takes away the focus from the subject through unnecessary repetition.

possessing – avoid applying human traits to chemicals!

methodology – is the study or description of methods, not the method itself.

represents – only for things that are actually representative, for everything else, "is" works just as well.

both – usually unnecessary and does not add anything to the meaning of the sentence.

significant advance over previous reports – what advance? Be specific!

functionalized polythiophene compounds – unnecessary repetition again!

a opens new avenue towards – sounds grand, but non-specific metaphors generally do not add anything to the understanding of the concept.

novel – redundant – of course things that haven't been developed yet are going to be novel! Another note on this word is that everything that is reported in a scientific journal should be novel, so it is not necessary to explicitly use it in your title/abstract/writing in general.

Simple Language

OK, so how did you do on last month's task of making a simpler passage of the following?

"Functionalized polythiophene compound 1 exhibits attractive electronic properties and shows fluorescence due to functionalized polythiophene 1 possessing a benzyl group at the C5 position. This synthetic methodology represents both a significant advance over previous reports of functionalized polythiophene compounds and opens new avenues towards developing novel photoexcitable oligomers."

Hopefully you came up with something like this:

"Functionalized polythiophene 1 has useful electronic properties and fluoresces because it has a benzyl group at the C5 position. Our synthetic method has three fewer steps than those reported previously and can potentially be used for further development of photoexcitable oligomers."

The important point about our new passage is that the crucial technical information and its implications, that is, the electronic properties, fluorescence, the C5 benzyl group, and using this method to develop more photoexitable oligomers, has remained exactly the same. It is also specific; therefore, even if someone only reads your conclusion, they can get a good idea of the advantages of your method.

Bringing Your Message to the Reader/Editor/Reviewer

The thesaurus function is very convenient in the popular word processing packages for finding all sorts of alternative and more complicated words for whatever you want to say. However, as Oppenheimer showed in the study cited at the beginning of the first part, complicated words may sound impressive to you, but they often have the opposite effect on your reader. A reader/editor/reviewer may be turned off and may well miss the whole point of your manuscript if it is unnecessarily dressed up in difficult language.

Bringing a Better Understanding of Science to the Public

A secondary point here is that we know that there is a problem communicating science to the general public. Scientists are regarded as unintelligible because we routinely use complex language which makes science seem out of reach to the non-scientist. Getting into the habit of writing in simple language in your papers can only help towards solving this problem, and bringing a better understanding of science to the public is in everyone's interest.

As a final note, I'll give the last words on this subject to a man who elegantly sums it all up: "Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius – and a lot of courage – to move in the opposite direction." Ernst Friedrich Schumacher, 1911–1977.

After Submission and Handling Referee Comments

Manuscript Rejected

There are some estimates that say one peer review would cost hundreds of dollars if referees were paid, professional consultants. They are not. Reviewers volunteer to help improve the quality, scientific content, and readability of your manuscript, which makes the peer-review process equivalent to getting thousands of dollars' worth of valuable information from extremely experienced people for free. Therefore, it's up to you to make the most of it. Whatever the outcome of the peer-review process there is a chance to improve your paper afterwards, so don't ignore it.

First, we'll talk about rejection. It's not nice but it happens to everyone.

You will receive a list of comments from the referees who have reviewed your paper. ***Don't just ignore these comments and submit the manuscript without changing it to another journal*** *because one of two things is going to happen.*

The next journal sends your paper to different referees but it comes back with similar comments and the paper is rejected again.

The next journal coincidentally sends the paper to the same referees as the first journal and the referees see that their time was wasted the first time round because you took no notice of their comments. They will instantly recommend rejecting it again.

In both cases you just waste your own and everyone else's time and your paper still doesn't get published anyway. It is better to take the time ***to really think about the referees' comments and revise your manuscript*** *before you resubmit it to a different journal.*

Frequently, referees will give a short list of a few examples of things that need to be looked at or corrected. In this case, ***don't just correct these few examples****, but consider the comments in the broadest sense and check through yourself to see what else you can improve. That way you have a much better chance of getting your manuscript accepted next time because it will simply be better science.*

Unfair Review?

Having a manuscript rejected is an upsetting experience, but is also one that you can learn from. The referees' comments are there to help you improve your manuscript so you get a better result next time. However, what happens if you think you've been treated unfairly during the peer-review process? What if you think the referee has missed a really important point in your paper? Perhaps you think that the referee has made the wrong interpretation of your data or neglected previous results that agree with yours.

You should think of the peer-review process more as a critical discussion of your paper and remember that referees are human too, which means they sometimes make errors. You are entitled to appeal a decision that is made on a manuscript, but you must have very good scientific reasons for it.

The best way to do this is to write a letter to the journal editor that explains your opinion and the science behind it. Point out where you think the referee has the wrong idea or has missed something and why this affects the overall assessment of the manuscript. The editor will then consider all the evidence, possibly with the help of another referee or members of the journal's editorial board, and decide whether to accept or reject the manuscript.

What you should definitely not do is write a ranting letter telling the editor how many other articles you've published in how many other journals and that this is the first time you've had this ridiculous problem and you can't believe the decision and you're heartbroken and you're the chair of this department and you've just won this prize ... and so on.

When you get a rejection letter from a journal take some time out to think, and then if you want to appeal, write a dignified letter that contains a strong scientific case for reconsidering your manuscript. Unless the science supports your claims, an editor will not look again at your manuscript just because you're upset!

Manuscript Accepted or Revision Requested

So, the journal has either accepted your manuscript or requested that you revise it for another round of peer review. In both cases, you should do exactly the same thing: revise your manuscript in accordance with the recommendations of the referees. ***Consider the referees' comments in their broadest sense and try not to just alter the few things that they might have specifically mentioned****. Try to be as thorough as possible.*

As with rejected manuscripts, and especially in the case of a manuscript that is being revised for another round of peer review, if you believe that a suggestion made by a referee is unreasonable or is not scientifically accurate, then you should say so in your cover letter that you send with the revised manuscript. You are entitled to challenge the opinion of any referee but you must have solid scientific reasons for doing so. Editors and referees do not like laziness, ***so simply not bothering to address all of the comments is likely to get your revised manuscript rejected*** *and, perhaps more importantly, it is likely to get you a bad reputation.*

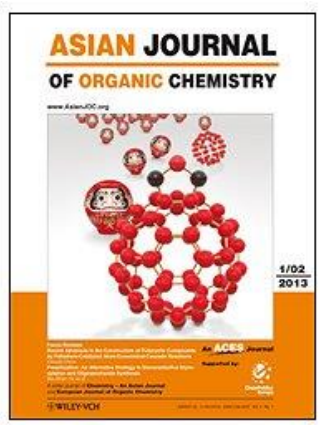
After making the revisions, you should then electronically highlight all the changes that you have made to the manuscript in a bright color and thoroughly describe all the changes in the accompanying ***cover letter****. Believe it or not,* ***the highlighting and the letter are incredibly important****, especially when the journal requests that you revise your manuscript. Editors and referees are human too, so nobody wants to search through many pages of your paper to find the most important changes. Marking the changes and explaining them clearly in your letter* ***shows you are genuinely interested in improving your work*** *and not trying to do just the minimum to get it published.*

Cover Art

So the hard work is finally complete. Your manuscript is accepted and now it's time to inject a little fun by making a cover picture for your chosen journal.

When you think of creating a cover picture to send to a journal, perhaps the Ig-Nobel Prize doesn't immediately spring to mind. However, the motto of the Ig-Nobel Prize – "Research that makes people LAUGH and then THINK" – is a good starting point from which to think about your cover art. Your illustration does not necessarily have to make people laugh, but what you do want is an image that makes a big first impression on the readers, and then makes them think about your research. Perhaps you might also want to include something from your culture or country. After all, journals are international and people are interested to find out about other places. Give the reader a striking and colorful image to grab their attention and just enough scientific information to get them wanting to know more about your article.

Try not to make any text too small and avoid using colors that are very similar, that is, make sure there is good contrast between all the parts of the image and the background, so nothing gets lost. The most effective cover pictures are simple but intriguing. In some cases, outstanding cover art can even become part of the journal's publicity material, which gets your paper even more exposure.



Example from *Asian Journal of Organic Chemistry*

Of all the great covers that we've had in the *Asian Journal of Organic Chemistry*, the front cover of Issue 1, 2013, has been a great hit among our readers. The reasons for this are many, but to summarize, the image is not cluttered with numbers or data and the red and white color scheme is simple but striking. The C_{60} at the front gives a hint about the main theme of the manuscript, which is of course C_{60} chemistry, but it doesn't give any exact details – you have to read the manuscript to get those! This cover also includes something from the culture of the authors, which makes it a little more mysterious and interesting.