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Invited Article

Weaknesses in publishing: identify, correct and strengthen

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Abstract: Without doubt, one of the greatest barriers in publishing faced by many Asian, African, South American and Middle Eastern scientists is their language-based difficulties. English has most likely become the leading language of scientific publications, even though there are strong but isolated pockets of journals published in local languages. Thus, scientists who are non-native English speakers will find English to be their number one priority, after the scientific content of their manuscripts. This article details my frank interpretation of what I see as being the greatest hurdles that need to be overcome if science writing is meant to be improved other than the scientific content itself, and how to make measured choices that would ensure the best representation of their work. I provide personal, concrete measures and advice on how a young and budding scientist, or even an established scientist mainly from non-English speaking countries, could tackle non-science-related problems. This advice has been formulated from personal experience as a scientist, writer, consultant, editor and director. I hope that it will prove useful to the readers either as a refresher-type 'course' or as a learning experience for those embarking on a new journey into science publishing and writing.

Keywords: publishing, language difficulties, gap in science, love for science

* *Dr. Jaime A. Teixeira da Silva graduated from The University of the Witwatersrand, South Africa, majoring in botany and genetics. He has held research positions, including postdoctoral, at Lisbon University, Portugal and Kagawa University, Japan. His PhD work was in ornamental biotechnology. He has published or co-authored over 70 book chapters and 250 peer-reviewed papers. He is the founding and current editor-in-chief of Global Science Books (www.globalsciencebooks.info).*

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BROAD CONSIDERATIONS

Back to Basics

Whenever I consider how to write a manuscript for an international scientific journal, I always appear to re-trace my steps back to the first years of undergraduate studies. It seems like the advice I received at that time (detailed below) was the most important tool that would most support the rest of my scientific writing career. Thereafter, through trial and error, and often through painful sacrifices, I began to develop a writing skill which would define my style and sense of interpretation of scientific facts, two factors that strongly influenced the fortunate collection of manuscripts that I have published to date. This paper highlights the main points as I see as being the most important in developing writing skills and strengthening the content of a scientific paper to be submitted to an international journal. There is a wealth of printed and online journals, with and without an Impact Factor®, subscribed or Open Access, that can accommodate almost any level of science as well as taste, creed or culture. My hope is that these guidelines will prove useful and bring budding scientists a step closer to improving their scientific writing skills. To the reader, kindly note that I am not an expert on improving scientific writing skills and the advice that lies herein is based exclusively on my personal experience, primarily as a scientist and as an editor.

Formulate an Idea, Develop a Hypothesis, Grow the Research, Reap the Benefits

An experiment evolves from the birth of an idea. If the idea has no substance, if it is not based on some inspirational seed of thought or does not test a fundamental hypothesis that has not yet been tested, even if small, then the chances of having the study published in a good journal are likely to be slim. So one would have to ask oneself the following questions at the planning stage before beginning the experiment:

a) Has this research ever been published and if yes, was the same material/method used? If not then has the unique value of the manuscript been made clear in the Abstract, Introduction and Results? State the objectives, the hypotheses and what the study initially set out to achieve when the research was started. Always be sure to follow up with future perspectives of the next step in the research somewhere at the end of the Discussion or Conclusions section. This always adds some continuity to what is being done and indicates to the reviewer that there is a broader content to what has been investigated in the study. I always advise my colleagues that not everyone can publish in *Science* or *Nature*, but that each and every one of us has the capacity to identify a unique 'gap' in science where a new discovery could be made. Never shun your own ideas, never be shy about a modest dream to discover something, and never be afraid to ask for help, even if you are the leader of a field of study, in trying to achieve it.
b) If one were to disprove a null hypothesis, then how novel would the results be? Would you consider your own results to be of high international value, high value but geographically localised, or of low practical value or low regional interest?
c) Even if the results are not that interesting or novel, do you have the creative ability to make the story surrounding the data interesting? Even if the methodology used is not that popular, can you still show the effectiveness of simple but powerful techniques? Many top level journals receive

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dozens if not hundreds of manuscripts a month and often there is a first phase of selection. During this phase, even if the results are fairly simplistic, provided that they can show some futuristic application or indicate an extension of a concept, the chance of acceptance even with only a single set of data is high. If you feel that something has never been researched before, possibly because the concept would be laughable, ignore those laughs and follow your gut feeling and scientific base. More often than not, you will be the last one laughing.

Based on these three initial assessments, a journal should then be selected that would best correspond to the estimated quality and level of the manuscript's scientific value. Always aim for a slightly higher level journal that you would expect to publish in at first (if time permits) and then downgrade later if necessary. The quality of books is rapidly diminishing and unless the publisher can provide a top-class product on high-quality print medium with a perfect finish, your best bet is to aim for a respectable journal instead.

Experimental Design and Statistical Analyses

A poorly designed experiment or an experimental set-up that has not been well thought of can result in a waste of many months' work in the lab or in the field. I was always told as an undergraduate that for every hour spent in the field (or lab), six hours should be spent at the desk, either analysing data or writing. This is an excellent rule of thumb. Sample sizes or treatment replicates not considered carefully can often result in a journal turning a manuscript away even before it enters the peer review per se. Define the samples clearly including controls, explain the methodology in sufficient detail to allow for the protocols used to be completely reproduced, or if they are based on a previously published protocol, then provide that reference. It is advisable to redefine a protocol using one's own words when it has been published a long time ago or in a difficult-to-access or old journal or source. If detail is not required, the editor will then advise you to remove it later. The choice of statistical analysis will also be fundamental in the interpretation of data and will affect the conclusions that emerge from the work's results. Explain clearly the experimental design used, the statistical treatments and any software that might have been used. Never make the common and grand mistake of matching the analyses to the data set so that the interpretation is swayed in the direction you want it to go. This is unethical.

PERSONAL QUALITIES THAT INFLUENCE THE OUTCOME OF A PAPER

Persistence

It is often said that practice makes perfect. This could not be more true than in scientific writing. You might fail to publish in one journal, but after editing your manuscript more than once you might find that another journal might consider your work to be of value and thus publishable. Do not give up and if you believe that you have a result of interest or practical application, then believe too that there will be a journal that will share your vision eye-to-eye. Improvement of the content can come through discussion with colleagues, peers or supervisors. Try to assimilate as many ideas as possible since this will likely represent the heterogeneity that will exist in the peer review stage.

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Publishing is increasingly competitive and as scientists excel more and more at publishing in higher level journals, so too does the possibility of having work published in high level journals diminish.

Desire, Passion or Ambition

There are several reasons why people want to publish: a) they need to publish; b) they would like to publish; c) they have no option but to publish! Naturally, a scientist who has a desire to publish will most probably meet with success because the wish is genuine. A manuscript written because of an artificially-imposed pre-requisite or formal requirement can often result in a poorly written text since there is no real desire to do so. More often than not, scientists who work in a research institute are expected to publish a few papers per year, preferably in high level journals. It is my experience that those who have an innate passion for their subject matter tend to express it very readily in a scientific paper. What the reviewers and editors find from that initial submission is how much passion and care is put in that manuscript. Manuscripts submitted with sloppy style, no attention to detail or in the incorrect journal style tend to create a bad first impression that is likely to linger throughout the entire review process and may affect its outcome. Remember that reviewers and editors are human like you and they all have their regular stresses at home, at university, and so when they receive a poorly written or messily presented manuscript, it is likely to negatively affect their initial (and possibly final) decision. Lower level journals tend to look past these aspects or not consider them too seriously while higher level journals will most likely turn this type of manuscript away a day or two after submission, or at best request the authors to make the necessary edits and re-submit. As editor-in-chief of my journals, the approach is rather unique. Prior to initiating the peer review, there is an intense style and language revision stage. Authors are not or rarely turned away immediately and manuscripts, even those that are riddled with errors, are given a unique opportunity to improve, two or three times if necessary. The philosophy is that human error is inherent and should not be a factor for punishment. However, if the same errors are ignored or not addressed, expect the manuscript to be rejected without entering the review process. On occasion, the manuscript is rejected prior to the review process due to narrow focus, incompatible theme with the journal's objectives or simply because more mechanistic explanations are not provided as required to meet the standards of that journal. In this case, the scientist will have to evaluate the target journal more carefully and reassess the pertinence and effect of the study's results in a broader scientific community. This will of course depend on the inherent knowledge of the topic and the field of study and good experience with a range of journals.

Try to reach a balance between what you have to do and what you want to do. A scientist who is ambitious will more likely pursue a career more strongly than another who does not place so much emphasis on their job, and usually the skills learnt in one manuscript will prove valuable in the next manuscript submission.

Time and Balance

We are all busy, and for most of us (unfortunately), most of the time. This seems to be a new reality as competitiveness and excellence begin to define everything we do in the workplace. We

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think that we save time with our new hi-tech trinkets, our blogs and social networking sites, but in fact our time is being cut shorter and shorter. Increasing demand for quality at the work place, more publications and higher level publications, made easier by faster processing speeds, easier software and more user-friendly online submission systems, will all add pressure to an already stressful task of writing the manuscript. A balance needs to be struck between what you have to do and what you want to do, between work and family, between workplace and home. More time can be created by focusing on the important aspects only. A balanced work and personal life will result in a more satisfying writing experience, no doubt.

Confidence and Reliance/Dependence

More often than not, we work in research groups where the emphasis is on group achievements. Even in non-Asian cultures where the individuals, rather than the groups, like to emphasise their own personal achievements, group work is essential. Each person in the lab plays their part, and partners external to the lab play theirs too. This almost invariably implies that each member, corresponding almost always to a co-author of a paper, will have different strengths, functions and responsibilities. When compiling a scientific paper, always be sure to pass the final text to peers and colleagues after all the co-authors have made their suggestions and edits. Never submit a manuscript unless all co-authors have seen, and approved, the final draft. Although too many cooks may tend to spoil the broth, in the case of scientific writing, occasionally more minds will positively influence the quality of the text. Making a mistake of pre-emptive submission may lead to embarrassing situations, which may result in (or actually have resulted from) conflicts of interest and, in worse-case scenarios, ethics violations. Over time, one will learn to appreciate co-authors' comments and will be able to pre-empt errors in submission through experience with previous manuscripts. At some point the learning curve, i.e. ability to write and express in your own way and to submit and respond to reviewers' and editors' queries, will reach a plateau, and at that time you will neither need to read this advice nor rely so heavily upon others to assist you.

WRITING SKILLS THAT INFLUENCE THE OUTCOME OF A PAPER

Basic English Skills

One does not have to be Shakespeare to write a scientific manuscript, but most certainly there should be a good command of the English language. Most international journals publish in English and require that the English be of a high level. If the author is unable to provide such a level of script, then either the assistance of a colleague who is proficient in English or a professional service is often required or requested by the journal. Write formally and write succinctly. Some journals accept that co-authors are included who did not necessarily design or perform the research but who significantly wrote, compiled or improved the manuscript for publication (i.e. at the scientific and linguistic levels). English revision services usually charge in the range of US$ 100-250 for a short communication of 1500-300 words or US$ 200-400 for a research paper of 3000-6000 words. As is evident, most scientists in most non-English speaking countries would not be able to afford such a service, which can amount to a month's salary or more. Therefore, if a scientist is

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absolutely unable to write his/her own manuscript and/or feels that inviting a high level scientist as a co-author and thus team member would significantly improve the quality of his/her text, then do so. I am of opinion that there is nothing unethical about this decision and that it may give a scientist—even an established one who has reached a plateau in writing ability—greater confidence through learning as to how to better improve writing skills until he/she is confident enough to complete this task on his/her own. Always make sure, however, that this agreement does not result in conflicts of interest with co-authors, with the research institute where the research is conducted or with funding bodies. This is a complex and highly sensitive topic and can be the subject of another separate writing. Such co-authorship collaboration is currently a grey zone in science publishing, and to clarify this we need to approach science publishing in a step-by-step manner.

Whenever I establish an international co-operation of this type, I always set out the most rigorous ethical policies possible and request all of my co-operating partners to agree to every single point, without exception. Note that these are only guidelines and should be set to meet the individual requirements of each research group or study.

Declaration of Ethics of Co-operation:

a) This co-operation exists with an understanding that this work is original, has not been published before, has been executed in the most scientifically rigorous manner possible, and has not been considered for more than one journal.
b) This co-operation exists with an understanding that there are no conflicts of interest between any of the co-authors or any of the authors and research institutes and/or funding bodies.
c) Any possible conflicts of interest that have not been fully and openly declared are and will be the FULL responsibility of the host research author(s) and institute.
d) Submission is also the FULL responsibility of the host research author(s) unless specifically requested due to difficulties with language or complexity of online submission systems. In that case, I will serve only as the vehicle for submission but the original authors will remain the official authors for correspondence in the manuscript itself.
e) The functions performed by me (upon request) include advice on data analysis, advice on experimental design and analysis, critical assessment and evaluation of scientific content, and language improvement, each to a different extent but all-inclusive nonetheless.
f) It is understood that such a co-operation is NOT standard BUT constitutes a unique, but not unethical, means of co-operation, as established by all parties concerned. Independent of this co-operation, the ethical guidelines set out by relevant journals, research institutes, funding bodies and publishers will be fully respected.
g) Submission of this manuscript to any and all future journals implies that all conditions a) to f) have been read by all parties and are fully understood.
h) To ensure that all conditions are met, each revision and submission step will be communicated to all authors by e-mail. This is done to avoid any misunderstandings or conflicts and to promote full transparency and open communication and discussion at each step of the editing process.

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i) The choice of journal, publisher and publishing medium (online or print, journal or book), format (open access or paid subscription), and level of quality (with or without Impact Factor®) will be decided upon by consensus.

Failure to meet even as much as one of these requirements will result in the co-operation not taking place due to conflicts of interest, personal or professional.

Never Assume Eloquence and Talent

One of the basic flaws in many manuscripts that are submitted by researchers for the first time, and indeed by experienced researchers too, is the assumption that what they have written is correct and logical. No matter how many times a scientist reads his/her own manuscript and no matter how convinced he/she is that the content is correct and good, there will always be errors somewhere! We always observe things in a subjective way through our own perspective, and often it is useful to sit together with the co-authors to thrash out better structured sentences, more concise phrases or clearer concepts, better understanding and interpretation of the data. If English is not a scientist's first language then it is always advantageous to improve writing skills through training exercises, although there might not necessarily be a correlation between English and scientific English skills. Even if a scientist is a leader in a field of study, there will always be different interpretations held by each person (editor or reviewer) who reads the manuscript, and this may be the case even after it has been published, so it is important to eliminate ambiguities early to avoid confusion (in the mind of the reader) later.

Think Like an Editor and Reviewer

Whenever submitting a manuscript to an international journal, always expect there to be about three levels of revision: linguistic, stylistic and scientific. Each journal or publisher will have different approaches and levels of importance assigned to each of these. In the journals for which I am editor-in-chief, there is an initial screening of the manuscript. If the authors have bluntly ignored the instructions for authors and the guidelines for submission of a manuscript, then the manuscript is immediately returned for correct formatting. If the manuscript is correctly formatted but the text is too unclear or poorly written (language-wise), it is returned for linguistic improvement. To save time (author's and journal's), close attention should always be paid to the style and requirements of the journal. Write a good covering letter, but do not be verbose. State only what needs to be stated. Do not just copy-paste the abstract into the letter; that will surely irritate the editor/reviewer. Remember that in most cases editors and reviewers are humans too, and that they have their careers, their responsibilities and their personal lives. In general, they are busy and they do not have time or patience for errors or messy submissions. Therefore, a manuscript that is incorrectly formatted, poorly written, with messy presentation or with weak language skills will most likely receive a negative response almost immediately. Half of the success of an accepted publication is a manuscript that takes these very basic requirements into consideration, which would leave the editor and/or reviewer the space to simply focus on the scientific content. So before submitting, have a long, good look at your manuscript and ask yourself: Am I happy with the quality of this submission? And will

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the editor and reviewer who receive it be initially satisfied with the quality and willing to read and assess further? The reader might easily interpret my call to think like an editor and reviewer as being a request to conform to a standard manner and style of writing. Not at all. I strongly encourage authors to adopt their own style of writing wherever possible, alone or with the assistance of a professional service or appropriate co-operating partner.

Graphics and Tables

Remember always that figures and tables are meant to support the text and not repeat any data within it. So always provide these in a way that will strengthen the content of the text. Basic and simple things like defining all abbreviations in the table footer or figure legend, showing error bars, *P* values or the test of significance employed are actually essential pieces of information that makes the table or figure independent of the text. Photos that have poor resolution, graphs that have different font sizes and styles, and tables that look messy and with poorly organised data are all ice-bergs waiting to sink your manuscript entitled "The Titanic."

SKILLS IN DEVELOPING THE INTRODUCTION AND DISCUSSION

Synthesise and Paraphrase

Synthesis of information is vital for crunching a mass of information into a limited space. Most journals are getting stricter and stricter about word count, size of sections and manuscripts themselves. The capacity to synthesise thoughts and data is thus one vital aspect to the success of the outcome of the review process.

Occasionally we find text that is so well written and that perfectly describes what we want to say. If those words are used directly, then they should appear in quotation marks, and a general rule of thumb is never to quote more than 100 words to avoid copyright infringement. If there is a fear of such an infringement or the journal cannot provide clear and suitable guidelines, then avoid direct quotes. In this case, try to reduce what has been said in a few lines, i.e. paraphrase the concept so as to capture the essence of the idea, remembering always to reference the source. If due recognition to the words or ideas from another source is not given, this constitutes plagiarism, which is an ethically grave publishing error. This topic can also be dealt with separately in more detail in another paper.

Speed-read

When writing an invited review, for example, one often has to sift through dozens if not hundreds of articles to find information that would strengthen the review within the shortest possible time. Since time is always the limiting factor, and unless there is an assistant, the best way to cover so much literature is through speed reading. When trying to find suitable references to build the Introduction or references to support the findings in the Discussion, speed-reading is a very helpful technique. There are no hard and fast rules, and such an ability comes with practice and years of experience.

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Link to Your study: Relevant and Up-to-date

Whether the Discussion is separate or joined to the Results section, always be sure to reference any studies from the literature that are directly (or closely) linked to your study or to its results. Do not add masses of references just because you think this will impress the reviewer. The reviewer will be more impressed if you reference less but show the links more strongly using pertinent studies. Always remember to provide an updated reference list, so check major data-bases just before submission. Check the limits for section length and reference numbers but a safe guideline would be a roughly equal size for each section.

THINGS NEVER TO DO IN A SCIENTIFIC PAPER

Although the following comments may appear obvious, there is surprisingly a high number of manuscripts, even to top level journals, that breach one or more of the following:

Never falsify data. Never plagiarise. Never self-plagiarise. Never simultaneously submit manuscripts that have already been submitted to another journal. Never submit data that pose a conflict of interest with colleagues, financial institutions or your research institute. In co-operation settings, it is always best to follow the basic rules as described above in "Declaration of ethics of co-operation."

Always conduct research and submit with the highest possible level of ethics. Remember that there are also now easier ways of digitally tracking manuscripts and information within them and to make an ethical error could jeopardise your career and taint your name and the name of your institute.

SUMMARY AND CONCLUSIONS

Writing a scientific paper for an international journal is for some a pleasant experience while for others it is a stressful one. Most certainly it will contain both aspects but hopefully within the text above you may find at least one point that might lead you closer to having your important research results published more easily and more effectively. Remember that a manuscript which is well written (style-wise) and contains clear and grammatically correct English, which follows the style of the journal and proves the hypotheses initially set out in the Introduction will have already fulfilled half of the requirements for publication in any journal. The remainder depends on the quality of the research that was conducted, on the scientific merit and uniqueness and on the strictness of the review process.

Note always that quality (as in the 'quality' of a manuscript) is often made into an objective (factual) parameter by each journal based on specific guiding principles and selection criteria, but it is often implemented by editors and reviewers who provide, to some extent, a subjective (personal) view, even if underlying.

I wish you well in your professional writing endeavours.

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I wish to thank Pham Thanh Van for critical opinions and for support in turbulent times. This text is dedicated to all those scientists who inspire me with their passion to make it happen. This message is for you: "Rise and rise again until lambs become lions" (Robin Hood, 2010).

ANNEXE

Helpful statistics sites:

SurfStat Australia: http://www.anu.edu.au/nceph/surfstat/surfstat-home/surfstat.html

STEPS: http://www.stats.gla.ac.uk/steps/index.html

HyperStat: http://davidmlane.com/hyperstat/

The Mesa Cohort: http://glass.ed.asu.edu/stats/

Virtual Anesthesia Book: http://www.virtual-anaesthesia-textbook.com

Useful sites for practicing English and improving grammar:

http://www.shared-visions.com/explore/english/ http://owl.english.purdue.edu/handouts/grammar/

Other similar resources but with more formal structure:

http://www.cumc.columbia.edu/dept/gsas/ac_programs/writing.htm

http://www.ajronline.org/cgi/content/full/188/5/1179

http://codecourse.sourceforge.net/materials/Writing-Research-Papers-Collected-by-Nakov.doc

http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html http://www.word-medex.com.au/formatting/index.htm

http://www.columbia.edu/cu/biology/ug/research/paper.html

http://www.sciencebuddies.org/mentoring/project_research_paper.shtml

Plagiarism:

http://www.ehow.com/about_6368008_description-constitutes-plagiarism.html

http://plagiarism.org/