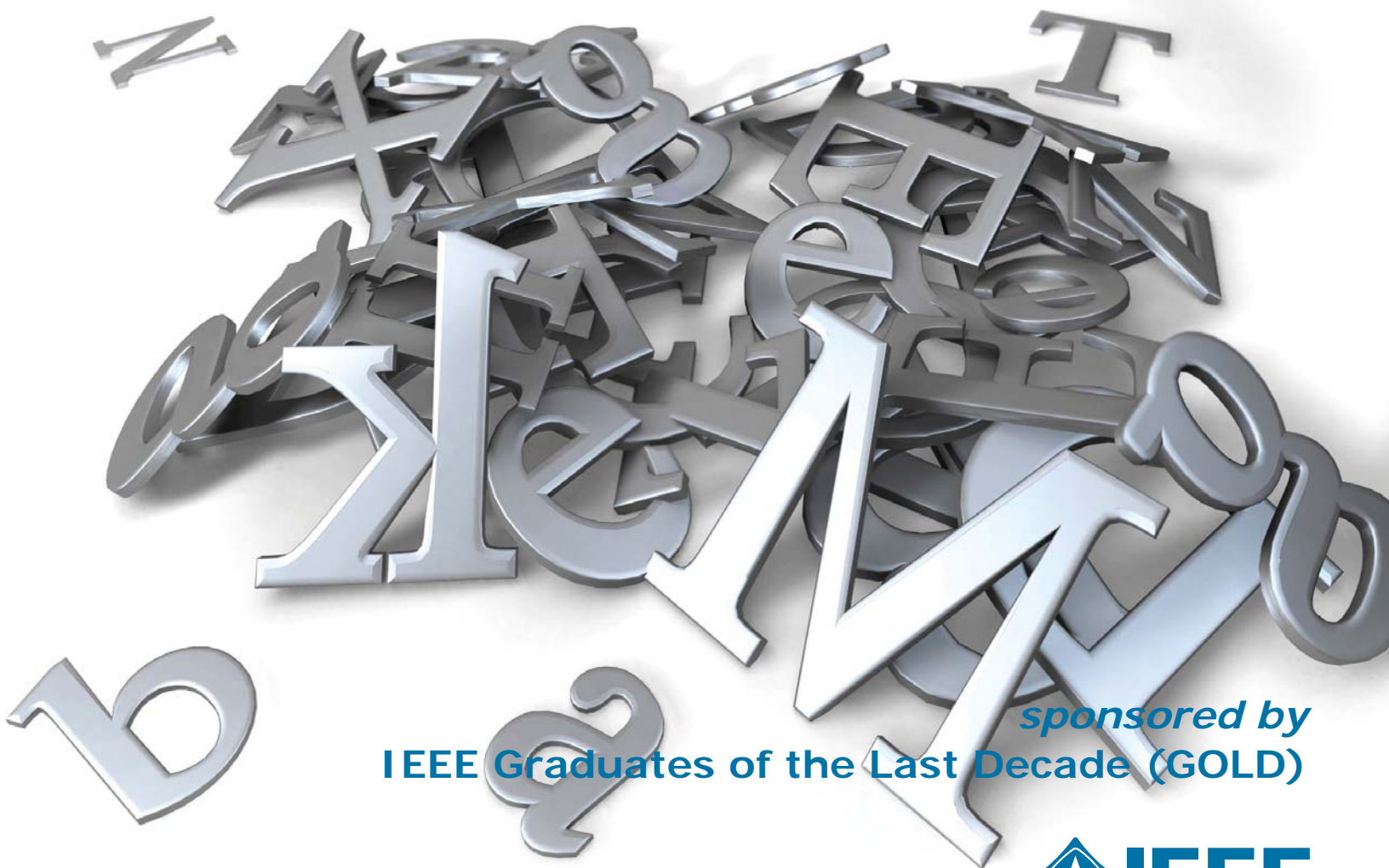# PostScripts

Q&A from IEEE Webinars

Survival Skills for Scientific Writing in the Academic and Professional Environments

by Dr. Matthias Reumann

◆IEEE

Professional writing skills are essential in academia and industry. May it be for an article publication in a scientific journal, a grant application, or a project proposal, writing is part of a professional's every-day activity. Unfortunately, the process of writing can be problem-prone, time-consuming and dissatisfactory.

IEEE Graduates of the Last Decade (GOLD) recently hosted a Professional Development webinar for young professionals, "Survival Skills for Scientific Writing in the Academic and Professional Environments". Dr. Matthias Reumann, an IEEE GOLD member, presented a highly demanded and popular webinar on the backbones of an article; overcoming writer's block; techniques to improve writing skills; and preparing a manuscript for editor review.

Dr. Reumann's theories provoked a series of questions from participants. Following are a sampling of these questions as well as the expert responses from Dr. Reumann.

What is the best method to start writing a manuscript?

Any method to begin the writing process is acceptable. Some people like creative writing while others prefer mind-mapping. The mind-map technique can be more productive when creating a document structure. However, when you need to tap into the flow of writing, you might prefer using creative writing methods.

One technique to help start the momentum of writing is to imagine writing a letter or an e-mail to a friend. Think of what you would say to your friend about your activity and describe the problem that you are having. Telling your story to someone is often easier that writing the manuscript so simply write down what you would tell a friend and work from there.

Writing methods are a matter of personal preference so it is very important to "know yourself". If you don't know yourself now, don't be discouraged. In fact, finding yourself is part of the writing process. Take the example methods for writing as helpful examples. Modify and test them. Try out the different techniques to find which style helps you most. The more you write, the more quickly you will determine the method that makes your writing most effective.

Sometimes it's difficult for readers to consult references, for instance, a reference to an old publication. Is it acceptable to discuss the reference as a subject rather than just citing it?

Yes, but there are a few guidelines to follow: 1) Discussion of the reference should not be too lengthy. The main point of the reference publication needs to come across in only a few short sentences. 2) The reference should only be discussed if it is relevant to your publication. A lengthy repeat or review of the cited publication has no place in a non-review article.

IEEE

When stuck in writing, do something completely different. Go for a walk, watch a movie, read a book, or sleep. Get your mind off writing so that you can return in a fresh state of mind.

How can one find and keep the momentum for writing?

Creative writing exercises can help you find the momentum to write. However, I find it very useful to go for a walk or do something else when I am stuck and can't find the momentum to write. Reading a good piece of literature often helps me find the inspiration to write.

A writing exercise that can help maintain productivity and momentum, is to narrow your focus from the whole paper to a specific section. Try using the clustering method or mind-mapping technique to develop the structure of your current section.

Another method to keep momentum is to write down one word (or a few words) per idea, per line. Once you have done that, read the words aloud. Put them in order. Then read out the sentences you would write. Finally, write down what you have just said.

If nothing else works, eliminate the surrounding distractions and just write.

What is the average number of pages of a good scientific paper?

I don't think there is an average number of pages. However, most manuscripts are approximately 20 pages long using font-size 12 with double spacing. The IEEE Transactions on Biomedical Engineering has a page limit of 8 pages per research article in printed layout format. You can use these numbers as a general guideline; however, check the journal's submission guidelines prior to submitting your manuscript. The 'authors information' section usually outlines how long the manuscript should be.

How technically deep should a paper be? Is it better to stay focused on the main idea rather than go too deep technically?

Your audience should determine the level of technical content in your paper. If you are writing for a technical audience, you must include all of the technical detail required to reproduce your work. In a technical paper, someone in your field should be able to read your paper and be able to conduct the same experiments that you undertook and get the same results.

Having said this, supplemental material or an appendix can be used to include technical details. Using a supplemental material section or an appendix will clean up your main manuscript for readers who want to understand the main point.

IEEE

What are some of the most popular mindmapping tools available? Are there software applications that support mindmapping?

Post-its and a large piece of paper and colored pens are the most popular mindmapping tools. These materials are used in many high quality workshops around the world to develop ideas. I am sure there are software applications that do similar functions. In fact, if you google the word mindmap, you will find thousands of links that include software. I have not tried any mindmap software because I am a paper and pen person.

Is it a good idea to write the paper prior to conducting the research and experimentation?

Yes and no. Usually you do research to investigate a problem. The purpose of research is to understand a problem and hopefully find a solution rather than get published. However, at some point in your experiments, you should start thinking about how you can publish your results. At that time, writing an outline of the paper can help you become clear about what you want to publish. You can then use the outline as a guide for conducting your experiments, e. g. what analysis is missing to complete the study for publication. Your work will become more focused because your outline is focused.

Please explain the meaning and use of a leitmotiv? How repetitive should one be to get across the leitmotiv?

A leitmotiv can be considered the main point, or case statement, of your paper. Make your case statement at the beginning of your paper and and show that your claim holds true by the work you have done in the conclusion. When you remain focused and sharp throughout your manuscript, there is no need to repeat the main point over and over again.

Is it appropriate to use adjectives in technical papers, for example "...our experiment have yielded DRAMATIC results"?

Adjectives like "dramatic" or "excellent" are not good in a manuscript because these words describe your personal opinion or feeling and are only partly based on the results. As an alternate, you chould use the phrase "significant results". You would then have to show that the results are significant; fortunately, there are tests that show significance.

Is there an issue with repeating the figure caption and text?

No. You will likely need to repeat the figure caption in one way or another in the text. However, try to rephrase and describe the figure in the text. Figures can be self explanatory and the caption does not need to include the detail that people see in the figure. The text should describe what you see to a certain extent.

> **Writing** an outline can help you become clear about what you want to publish. You can then use the outline as a guide for conducting your experiments.

IEEE

Novelty

is demonstrated when you have shown that previous work has not answered existing questions or that further questions have come from previous work. Establish a knowledge hole and then answer the problem in your paper.

What is Self-Plagiarism and how serious an offense is it?

Plagiarism is the misuse of other people's work and material by definition. Self-plagiarism occurs when you mis-use your own work. An example of self-plagiarism is if you publish the same work in two different journals. This is a serious offense and should be avoided.

That said, you may find yourself in a situation where you submit a paper to a conference and have your work published as part of a proceeding. Content for conference proceedings is often based on preliminary work. Once you have finished the project, you can publish the finished work in a journal without self-plagiarizing.

If you do publish your finished work in a journal, make sure to note that your work was presented at a conference previously and that you now have completed the study. If the manuscript for the journal shows significant new work, then there should not be a problem. Always make sure that copyrights are not infringed.

In some countries, PhD theses are published in books. You might have published your work previously in a journal and included that work in your thesis. This is common practice and not self-plagiarism. However, you should always cite your own publications in the thesis. If you reference the work and material you use, you are fine.

What are the general requirements for acceptance in a journal or conference?

Usually, you need to show high quality work that is novel and relevant to the journal and the reader. The manuscript needs to be written well and has to adhere to the journals guidelines.

Are there common questions to ask to determine the true novelty of an idea?

As described in the previous question, you need to first establish that your work is novel. This is generally done by inserting a brief literature review of the most relevant articles into your Introduction section. Your literature review must show that there is either something missing from other work or that the next step has not been done yet. Your novel work should fill the gaps and/or advance the field.

What needs to come across is "these articles have established X and Y but have not answered these questions" or "these articles show that there are new questions to be asked and we will take a step further combining the methods to advance the field". If you can get this point across, then you have established the novelty of your idea.

◆IEEE

When working under a deadline,

you should start working hard right away. It is better to put in long hours at the beginning than at the end.

....

What do you say about time management? Any tips on this?

Time management is an important subject. If you write a manuscript for a journal without a deadline, then you might find that the writing process is dragging on. You need to set deadlines for yourself and attempt to meet them.

Time management is more crucial if you have a deadline, for example if you are submitting for a conference or a grant. When working under a deadline, you should start working hard right away. It is better to put in long hours at the beginning than at the end.

When I am writing a conference proceedings paper, I typically establish a personal deadline in advance of the official deadline. For instance, if the real deadline is 2 months, I try to have the paper finished 1 month ahead of schedule. This "extra" time is important, especially when you work with collaborators or colleagues who have to read the paper prior to publishing. Your co-authors should receive the paper for review at minimum two weeks before the deadline.

Sometimes, conferences push their deadlines out by a week. When I started off writing manuscripts for conference proceedings, I always counted on those extra few days. While you might get lucky as I did, don't count on it. In fact, it is poor practice to rely on deadlines being pushed back. Instead, make a real effort to have your manuscript ready ahead of schedule rather than late. Keep in mind that formatting and submission will take a lot of time as well. Target having a printable version ready at least a week prior to the deadline.

My advice is to plan ahead. Know yourself and your work. Know how long it will take to run your experiments. Know how long you need for writing. In fact, start writing right away. The Introduction and Materials and Methods sections can be written while your experiments are being carried out. Once you have these done, you will have more time to write the rest of the manuscript. If you have to modify your Methods, it is far easier and quicker to modify what you already wrote.

Set your personal deadlines ahead of the hard deadlines given by others. It turns out that your life will be less stressful and you will be much happier and proud that you have completed the paper in advance. Get a head start and work night shifts at the beginning. This will spare you the night shifts at the end and help delay those grey hairs that appear eventually.

Any rules or guidelines that can be used to break a long sentence into couple of small ones?

One technique is to try and take a long sentence apart. Circle the nouns to determine if the sentence can be made into two sentences. Another trick is to write each subordinate clause in one line. Then, make a single sentence out of each subordinate clause. When trying to break down long sentences, remember the reader. Your manuscript will be more well-received if it is easy to read. Practice is the key.

IEEE

What writing skills can be utilized when you have a lot to write about but not much space? How can a 100 page paper be turned into a 6 page paper?

Severe limitations on paper length can be quite challenging. The solution to keeping within the length limitations is to focus on the main idea and not try to say everything. If you have too much to say, maybe you should consider writing two manuscripts. When you have written past the length limitations, go through the manuscript and look for paragraphs that can be left out or radically cut down.

Writers often put too much content in the Introduction section, so start at the beginning and look for text to cut. The next place to look for deletable content is in the Materials and Methods section. You don't always need to give the method in detail; instead reference other articles or your previous work. If you find a good review article in your research, you can write "for a detailed review of the subject/method see xyz et al. [reference]".

When you feel you have written too much, stop writing and refocus on the main problem. What is your claim? What do you need to write to prove it?

If you have a 100 pages that you want to turn into 6 pages, it is probably best to start from scratch. Summarize the leitmotiv of the longer article in one sentence. Focus and be sharp. Write down a few of the conclusions in one sentence. What should the reader take home after having read your article? Make your case in one or two short sentences. Once you have that, create the outline for the 6 page manuscript as described in the Webinar.

When you have the outline, you then can look back to the 100 page manuscript. Use it as inspiration for your writing. You can even take a paragraph or two from it or use the most relevant figures from the long manuscript. Keep the focus on the 6 pages. Can you combine figures to save space? Try to be sharp and to the point. Constrain yourself from writing too extensively about some points. Often a short sentence says the same thing.

What is the most effective way for literature review, to make our work stand out from other work in the field?

When you start researching literature, the most fortunate case is that an excellent review article has just been published that discusses your specific paper topic. This research article will most likely summarize the literature and you can build on this article highlighting the most relevant points to make your case. However, a review article is quite rare and shouldn't prevent you from conducting thorough literature research. Most of the time you might find that reading the abstract is sufficient and only the most relevant articles need to be read in-depth.

To make your work stand out from others you should give a brief literature review in the Introduction. It should only be a paragraph long and cite the most relevant articles. Write down the main points of the articles that relate to your work. Then, at the end of the paragraph, write that all the cited articles have in common that they did not investigate a certain aspect. You need to establish that there is a knowledge hole in the field. Once you have established that there is something missing, you can write that your study addresses this problem. That is a good case statement for why your study is novel.

REFERENCES

Erdogmus, Hakan. "Writing and Publishing Technical Articles for a Broad Audience." Jan 2010.
http://hakanerdogmus.net/weblog/2010/sintef-trondheim-norway

McConnell, Steve. "How to Write a Good Technical Article," IEEE Software Sept-Oct 2002.
http://www.stevemcconnell.com/ieeesoftware/HowToWriteATechnicalArticle.pdf

Klein, R. Wissenschaftliches Schreiben lehren und lernen. Teil I: Anwendungsbezogene Schreibübungen für Lehrende und Studierende. Neues Handbuch Hochschullehre. G 4.1. Raabe Verlag

Klein, R. Wissenschaftliches Schreiben lehren und lernen. Teil II: Die Konstruktion des wissenschaftlichen Diskurses – Anwendungsbezogene Schreibübungen für Lehrende und Studierende. Neues Handbuch Hochschullehre. G 4.2. Raabe Verlag

Klein, R. Wissenschaftliches Schreiben lehren und lernen. Teil III: Reflektierte Interaktion im wissenschaftlichen Diskurs – Anwendungsbezogene Schreibübungen für Lehrende und Studierende. Neues Handbuch Hochschullehre. G 4.3. Raabe Verlag

Newman, M. "The backbones of an article" 31. Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis, USA, 2009

Reumann, M. "Where to start? Overcoming writers block and other methods to improve your writing skills" 31. Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis, USA, 2009

Wheeler, B. "Preparing your manuscript - what are the editors and reviewers looking for?" 31. Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis, USA, 2009

About the Speaker

Dr. Matthias Reumann was born in Frankfurt/Main, Germany in 1978. He studied Electronics and received his Masters in Engineering in Electronics with the Tripartite Diploma in 2003 at the University of Southampton, UK. In February 2007, he received his PhD from the Institute of Biomedical Engineering at the Universität Karlstuhe (TH).

Since June 2007, Dr. Reumann has worked as a Post-Doctoral Fellow at the Computational Biology Center, IBM TJ Watson Research Center in Yorktown Heights, USA. His primary research interests are clinical applications of cardiac models to improve diagnosis and therapy planning for which he received a Young Investigator Award in 2006 and 2007. His work was awarded with the Wolfgang Trautwein Research Award by the German Cardiac Society and the Award of the German Society for Biomedical Engineering of the Family Klee Foundation in 2008.

Dr. Reumann is currently working on integrating multi-scale, multi-physical cardiac models on IBM's Blue Gene supercomputer to achieve fast simulation run times for highly detailed cardiac models which will leverage the models impact on clinical diagnosis and therapy.

Dr. Reumann is a member of the IEEE Engineering in Medicine and Biology Society, the IEEE Computer Society, and the IEEE Professional Communication Society. He is also a member of the German Society for Biomedical Engineering, the German and European Society of Cardiology and the International Society of Electrocardiology.

About IEEE

IEEE is the world's largest professional association advancing innovation and technological excellence for the benefit of humanity. IEEE and its members inspire a global community to innovate for a better tomorrow through its highly cited publications, conferences, technology standards, and professional and educational activities. IEEE is the trusted "voice" for engineering, computing and technology information around the globe.

Through its global membership, IEEE is a leading authority on areas ranging from aerospace systems, computers and telecommunications to biomedical engineering, electric power and consumer electronics among others.

About IEEE Graduates of the Last Decade (GOLD)

GOLD is an affinity group developed to help young professionals transition from being a student to entering the professional world. IEEE Members who have graduated within the last ten years are automatically categorized as IEEE GOLD. GOLD activities and programs are designed to help young professionals and recent graduates develop professional, personal, and technical skills to enhance their careers. For more information, visit http://www.ieee.org/web/membership/gold/index.html.