

Author's Preface

The purpose of this guide is to get you writing and publishing your research papers right NOW!

There will be no long-winded explanations, no blah-blah-blah about literary styles, no on-and-on about punctuation and grammar rules that you likely know already.

This book is geared towards researchers and academics who are ready to publish their work. This book and the accompanying course are perfect for you if:

- You have a fairly good mastery of your language including grammar,
- You have read research papers in your field,
- Your research mentor doesn't have time to teach you the specifics on how to write a research paper,
- You have written reports for your college classes,
- You are in academia as either a student, research assistant, postdoctoral fellow or junior faculty, and you understand that the key to success is to publish your research.

In this book, you will learn:

- How to find out whether your data is ready for publication,
- How to get you and your materials organized,
- How to start and continue writing,
- How to break down the project into doable tasks,
- How to prioritize your writing and find the time to do it,
- How to work with research mentors and collaborators to complete a paper,
- How to choose a journal for your manuscript,
- How to receive and respond to critiques,
- How to repurpose existing material,
- How to promote your research results so that they benefit you and the world.

I will take you step-by-step through the process of writing your research. I will tell you what to do and when to do it to get the most done in the least amount of time. If you follow these steps, you will be able to write and submit your research paper. Anyone who plans to thrive as a researcher will benefit from reading this book, doing the carefully planned exercises and/or taking my course Write Science Now.

If you already have publishable data, you will be able to put together your paper as you go through each step. If you are writing a paper while following along with this book, you should read one chapter of this book, and then follow all the instructions and steps for that chapter before moving onto the next. This book is not a novel; it is a how-to book. Use it. Follow the steps. Write as you read.

Keep this book next to your computer. If you are using the printed format of this book, make use of the margins and other white spaces provided to write notes. **You can also download fillable forms at www.drluzclaudio.com.** This book is designed to get down and dirty with you in the trenches of peer-review publication. Coffee stains and highlighter marks are expected.

I have created a companion online course, *Write Science Now*, found at: www.WriteScienceNow.com. In this course, you will find mentoring, direct instruction, motivation and a community of smart academics who are in the same boat as you are. There is a lot of support in our community forums. Use this book on its own or as a workbook companion to the online course. Either way, you win!

Research publication is an honor and a challenge with many rewards and many frustrations. The methods presented here are designed to increase your opportunities for reward while minimizing the anxiety and frustration that you may experience along the way.

These methods were developed for investigators just like you—students, new researchers and community leaders who are conducting excellent scientific work, and have yet to experience the thrill of being a published author or are looking to improve their writing productivity.

I wish you much success as a published scientist!

–*Dr. Luz Claudio*

Chapter 1: Publish or Perish, so Write Your Science Research Paper Now

“Research serves to make building stones out of stumbling blocks.”

– **Arthur D. Little**, chemist credited with the discovery of acetate.

Search for a generic image of a scientist on the web. Do it now. Just type “scientist” into Google Images. What do you see?

You will likely see row after row of pictures of people in white coats. What are they doing? Pipetting. Mixing test tubes with colorful liquids in a lab. Looking into a microscope...

This is the image that I had of what it would be like to be a scientist. Serious-looking people, mostly men, doing sciencey things. At least now, you will find that many of these stock photos of the prototypical scientist include women. That’s improvement! But still. Is it a realistic view of what scientists do every day?

In college, I filled out an aptitude questionnaire to help me through my career choices. It said that you need to be “good with your hands” and “good at math” for a career in science. So I focused on taking advanced calculus and spending extra time doing internships. I spent little time taking courses in literature, writing or the humanities above from what was required to graduate.

Little did I know that as I climbed up the academic ladder, I would end up increasingly needing those writing skills. As I progressed from postdoctoral training, faculty appointments and academic promotions, I started to spend less and less time in the lab doing the sciencey things that I thought all scientists do.

Slowly but surely, I started using my skilled hands and math proficiency that are necessary for experiments less often. Instead, I noticed a shift in the skills that I really needed to succeed in academia—I needed to write. Soon, it felt as if writing grant proposals and research papers was all that I was doing.

Being a scientist, I had to measure this feeling of shifting towards more scientific writing in my working life. When I was an assistant professor, I tracked every minute of my working time in a log for a whole month. I discovered that, even at that early stage in my career, I was spending

67% of my time writing. Whether it was research papers or grant proposals, the bulk of my time was being spent in front of my computer putting science into words. It became clear to me that I needed to

focus on these writing skills in order to succeed in research. Therefore, learning to write effectively became the focus of my career development strategy.

I bet this is not unusual. If you are an experimental or laboratory scientist, you likely began your career by getting your hands dirty in the lab, or working in the field collecting data from your experiments and observations. Maybe this is still where you are today. But before you know it, conducting experiments and getting the primary data will be delegated to the students and trainees working with you, leaving you with the main task of getting the word out about your discoveries and keeping your team funded.

So you'd better prepare yourself for this shift in the skills that are required for being a successful scientist. And you'd better make the process of writing as efficient as possible so that you can succeed.

How do researchers become writers?

Here you may ask, what do I write about if I don't have time to do the research? Good question.

Well, the process of shifting from spending most of your time doing the experiments and collecting data to spending most of your time writing happens gradually. It is a process that happens as you grow in your profession and start climbing the academic ladder.

As a PhD student, you spend your days attending classes and conducting experiments in the lab or in the field—collecting data. Mostly, you learn the techniques from the lab technicians, senior students and postdocs in the lab who work under the supervision of the principal investigator. What is the principal investigator doing most days? Lecturing at courses or conferences, attending meetings, troubleshooting lab issues and locked up in their office, writing.

To give you an idea of what your mentor may be doing locked up in their office all day, here's a clue: The success rate for RO1s (funding mechanism for health-related research supported by the National Institutes of Health) is about 15%. Writing just one of these proposals can take one or two months of intense work.

Let's say that an investigator has a better than average success rate of 20%. It is not uncommon for a researcher to send five proposals for every one that gets funded. At one to two months of writing per proposal, it doesn't take a math genius to conclude that this means a lot of time will be dedicated to writing grant proposals.

Add to that the amount of time that the principal investigator spends writing research papers, and you have someone who has effectively become a writer.

It happens gradually to most of us. It starts when you write your dissertation and coauthor a few papers, but the pressure to write really kicks in during your second or third year as a postdoc when you find yourself in the unending world of searching for grant funding to become an independent researcher.

At that point, you may also discover that your chances of getting funding are increased tremendously if you have peer-reviewed research papers. The papers will give you a better standing and credibility in

the field and will help to distinguish you as an independent scientist—someone apart from your previous mentors. Yet, even though writing papers will be increasingly crucial to your success, you will receive very little (if any) training specifically on how to write and publish research papers. This is a skill that you are expected to pick up along the way, as if through osmosis, or from your mentor, when she/he finds the time.

And such is the life of a research scientist. Still, science is an exciting and vibrant profession. It is fun to think of new ideas for research projects, to design a study that will answer a research question, to advance the level of knowledge a bit further, to share that knowledge with others and to always explore new areas that were previously unknown. I don't lament about the days of pipetting media into petri dishes. For me, communicating the discoveries of my team by writing papers and grant proposals is just as important and satisfying. It is what we do.

What is academic research, then?!

Well, according to the National Science Foundation: “Research is defined as systematic study directed toward fuller scientific knowledge or understanding of the subject studied”.

In that sense, to me, academic research is the search for knowledge using the scientific method. One thing that this definition does not say until much later is that most of this “knowledge” lives in peer-reviewed research papers. Research papers are the way that scientists communicate with each other, spread the word about their discoveries and make it possible for scientific knowledge to expand.

What is a peer-reviewed research paper?



A peer-reviewed research paper (also known as a refereed or scholarly publication) is an article that documents a research study and which has been subjected to the scrutiny of other experts in the field. Therefore, writing a research paper is similar to most non-fiction writing; it should be straightforward, to-the-point, organized and clear. A research paper is not a mystery novel! Scientific research writing aims to be clear and precise, leaving little to the imagination. But because scientific writing deals with complex topics, creating a straightforward, clear paper can be a challenge.

In science writing, your mission is to present your research with the utmost clarity, in a way that allows other scientists to replicate your methods and results. Your research paper should not read as a whodunit, nor should it leave the reader struggling to decipher what you mean or what will happen next.

Instead, your paper's structure should flow like that of a good cookbook; your paper should include all of the details the reader needs in order to understand the *WHO*, *WHY*, the *HOW*, the *WHAT* and the *SO WHAT* of your research, and come away understanding how your results fit into the broader scientific literature.



Research publication is vital for scientific advancement.

Peer review is the hallmark of scientific publication.

The importance of peer-reviewed research publications to your academic career

Why is it so important to publish research papers? The achievement of research publication is so crucial in the professional life of a scientist (especially in academia), that it is often described using the phrase “publish or perish.” The quality and quantity of a scientist’s published papers are often the basis for academic promotion and grant funding. A researcher’s list of publications is an important measure of success, and determines how he or she is recognized in his or her field. There is little else you can do that will beef-up your resume more than a good list of peer-reviewed published works in well-established scholarly journals.

There are many facets to being a scientist, but publication is a necessary one, and without it, a scientist’s greatest achievements will go unnoticed. It is on record that when a young researcher asked Michael Faraday, the great physicist, the secret of his success as a scientific investigator, he replied, “The secret is comprised in three words—Work, Finish, Publish.”

We’ve all heard the philosophical question, “If a tree falls in a forest and no one is around to hear it, does it make a sound?” We can also pose the question, “If an experiment is conducted in the lab and is not published, is it science?” Maybe. But it won’t advance knowledge in the field, and it won’t advance you in academia.

The Top 8 Reasons to Publish Peer-Reviewed Research Papers

- The act of putting your research to paper will help you clarify your goals for the research, will help you in reviewing and interpreting your own data and force you to compare your work with that of others.
- Peer review gives you important feedback on the validity of your research approach, and can provide insight on next steps for advancing and interpreting your work.
- Communicating the information that you have found will help other researchers advance their work, thus building on the body of knowledge that exists in your field.
- Writing and publishing puts your research into larger context.
- Your published paper can help in the public understanding of a research question.
- Having a robust body of published works helps advance your career as you are considered for academic appointments and promotions.
- Publishing helps establish you as an expert in your field of knowledge.
- Peer-reviewed publication provides evidence that helps in the evaluation of merit of research funding requests.

So, it is clear. You must publish. And not just publish, but publish in **peer-reviewed** journals. The process of peer review is the rigorous scrutiny of a scientist's scholarly work by other scientists in the same field. Peer review is the hallmark of scientific research.

Many would argue that the research endeavor has become mired by the demand on scientists to publish ever more papers. It is common for top scientists to have a publication list numbering in the hundreds. But how much does these prolific authors advance science is a subject of discussion. As Otto Loewi, the pharmacologist who discovered acetylcholine sarcastically pointed out: "A drug is a substance which, if injected into a rabbit, produces a paper." We must be careful not to let the pressure to publish dictate all of our research. There is much research that is worth pursuing, even if it does not ultimately yield a ton of papers.

Even Albert Einstein was caught up in the pressures of the publish-or-perish dogma. It was only after his impressive publication of five papers in 1905 that he was appointed as professor of physics at Zurich University. Further, it would not have been possible for him to publish these papers had it not been for the publications of other scientists before him who had also pondered the secrets of the universe.

Few of us will come anywhere near the brilliant publication of Einstein's 1905 remarkable papers. However, one thing is for certain—publishing important research results is one of the most important endeavors of any scientist.

Points to remember from Chapter 1

- Researchers must become writers. As researchers progress in their careers, their work demands higher levels of written output. Researchers must write grant proposals to fund their research, and research papers to support grant proposal ideas.
- Peer review is the hallmark of scholarly research work. A peer-reviewed research paper is a manuscript written by a scientist or scientists that details the results of a research study and that has been scrutinized and deemed of good quality by other scientists in the field.
- Publication of scientific articles, especially original research articles, is a necessary step in every scientist's academic career. The phrase "Publish or Perish" is often used to describe the pressure to publish research in academia.
- Principal investigators need their students and fellows to conduct the research to support the lab while they write because only a small percentage of grants submitted actually get funded, thus increasing the number of grant proposals that need to be written by principal investigators.
- Few principal investigators have time to teach students and fellows how to write research articles efficiently, and most graduate schools do not provide much training on writing and publishing research articles.
- Scientific research must be published in order for it to serve its purpose of building knowledge in the field of study.

Additional resources

Newport, Carl. *So Good They Can't Ignore You: Why skills trump passion in the quest for work you love*. Hachette Book Group, New York, 2012.

Exercise 1: Career goals

Think about your career in science thus far, and ask yourself the following questions:

EXAMPLE QUESTIONS AND ANSWERS:

| | |
|--|--|
| Today's date: | |
| Question | Answer |
| What is your main area of research expertise? | <i>Local and global issues in children's environmental health research and training.</i> |
| What work are you best known for in your field? | <i>Studies that showed that rates of asthma are highest among minority and low-income populations that also have disparities in exposure to environmental pollutants.</i> |
| What is the main goal of your current research? | <i>To develop computational methods to mine big databases for further evidence on how environmental pollutants affect children's health.</i> |
| What is your next goal for academic promotion or advancement in your career? | <i>To receive faculty award for academic and mentoring excellence. To be named to the National Academy of Sciences.</i> |
| What do you need to do to achieve this goal? | <i>To publish three papers in top tier journals. Create an effective online course. Mentor 10 students and 2 postdoctoral fellows Receive one additional RO1 grant</i> |
| When will you accomplish this career goal? | <i>Month/Year</i> |

Exercise 1: Career goals

Think about your career in science thus far, and ask yourself the following questions:

QUESTIONS TO BE ANSWERED BY YOU:

| | |
|--|---------------|
| Today's date: | |
| Question | Answer |
| What is your main area of research expertise? | |
| What work are you best known for in your field thus far? | |
| What is the main goal of your current research? | |
| What is your next goal for academic promotion or advancement in your career? | |
| What do you need to do to achieve this goal? | |
| When will you accomplish your next career goal? | |

You may go to www.drluzclaudio.com and download the forms for the following exercises, which you will be able to customize to fill in.