

Learning About the Genres of Biology

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This article explores the different types of writing that are encompassed in the biology genre. The goal of the author, Alyssa Shapiro, was to better understand how writing is used in biology careers and distinguish what makes the biology genre different from other writing genres. Using personal experience and research, Alyssa shares what she learned about the finer details of the lesser known biology genres.

As an aspiring biologist, I wanted to learn more about the biology field, including the kinds of writing I would do in the field. As a first step in this investigation, I wanted to learn about career options. I always thought that my only career options were to continue on in school to get a degree in medicine or to get a Master's to become specialized in a specific section of biology. After doing some research, I came to realize that there is a lot more out there in the profession than I initially thought. First I had a conversation with my advisor at Illinois State University, Megan Larson, who told me that a biologist is anyone that tries to expand our understanding of the natural world around us. While many biology students pursue careers in the healthcare profession, a lot of students seek out careers in research (Larson). I found out that if I wanted to be a scientist, it was important for me to be a strong writer. Successful scientists must be able to write many different kinds of texts, including papers for scientific journals, essays for research grants, lab notebooks, and even textbooks.

Research is vital to the field of biology. One of my professors, Dr. Wade Nichols at Illinois State University, states that biologists continue to do research in order to gain a better understanding of how the world works (Nichols). Some possible careers are laboratory technicians, research technicians, research assistants, and

professors of science, which all require strong writing skills. Each of these careers has its own writing genres in order to present the data they have accumulated.

Though research is important in biology, scientists would never be able to perform their research without getting funding. So, once I learned more about the research side of biology, I wanted to learn more about how that research is paid for. One text that biologists use to get funding is a grant application. Grant writing is necessary for science professors and private laboratories because grants are great project funding tools (Nichols). To learn more about grant writing, I talked to a professor I know, Dr. C. F. Shaw at Illinois State University. Dr. Shaw explained that obtaining grants is one of the best ways to fund research and that researchers must explain why what they plan to study is worthwhile, what procedures will be performed, why that is a good way to find results, and why their research team is the best team to do this research (Nichols; Shaw).

I also researched grant organizations that fund scientific research. I found some commonly used grant organizations including the National Institutes of Health (NIH) and the National Science Foundation (NSF). These government funded organizations are two of the most prestigious funding organizations in the United States. The NIH funds projects that will help increase our knowledge of current issues in health (“About the National Institutes of Health”). The NSF funds research that will further science as a whole and help us gain a greater understanding of the world (“About the National Science Foundation”). If I were applying for a grant, I would have to be sure that I follow the granting organization’s directions and policies exactly so my research could be considered eligible to receive a grant. Grant proposal guides, which explain the application process for grants, are lengthy and detailed. For example, the NSF Grant Proposal Guide is 32 pages long and is extremely detailed. If the writer doesn’t follow every step correctly then he/she will be denied (“Grant Proposal Guide”). Grant writing can be a tedious task because each grant organization has a specific submission format (Larson). It takes years to receive grants because it is a long writing process and it can take almost a year for grant organizations to process funding requests. Even though grant writing can be a difficult, time consuming task, it is a necessary part of the research process and it is worth it in the end (Larson; Nichols; Shaw).

Another genre of writing in biology that I learned about is used in the laboratory itself. Once a research group is able to get funding for their research, they must begin running tests and collecting data. That is when a laboratory notebook comes in handy, and this is one of the most common and important forms of writing that biologists produce. Laboratory notebooks are maintained by researchers in order to document results and write down procedures so they can be repeated by the original researcher or other researchers that want to perform the same procedure. Researchers write down each step of the

experiment or procedure they are performing and what day they performed them. Not only are experiment steps included, but pictures, diagrams, results, and any other beneficial information is included. Researchers write in their notebooks every day and keep them up to date so they do not miss any steps or forget anything they have done when carrying out an experiment.

I have experience maintaining a lab notebook because I have had to keep them for some of the classes I have taken. Also, I volunteered in a research lab and I had to keep an up to date notebook on all of the experiments I performed. My notebook had to be updated each time I did an experiment. I had to include the date, the procedure I performed, all of the steps I completed, and any other information I used that day. Laboratory notebooks have been used for centuries by many different scientists and alchemists, including Leonardo Da Vinci and Michelangelo (Shaw). Science is very competitive, so these notebooks are used as proof of when scientific discoveries occur and who discovered them first. Also, notebooks are not allowed to be removed from a lab because they may have classified information.

After I learned the importance of scientists documenting every experiment they perform, I needed to find out more about what scientists do with the data they collect. Once scientists collect all the data that they need, they can use the information to write a scientific paper. In my classes I have had to read and approximate writing several journal articles about various topics in biology. My professors preferred we use journal articles as sources because they are the most up to date because journals take a shorter time to publish than books. In addition, most journals require each paper submitted to be peer reviewed to ensure high quality work. I will talk more about peer reviews later, but a peer review is when other scientists read and edit your article to make sure the data and information is correct. Journals can be found in hard copy or online. I found that scientific journals are very similar to grant organizations because each one has its own requirements. Some journals have short page limits of 3-5 pages while other journals do not have a page requirement at all.

While requirements may vary, after reading several articles, I noticed that each journal has a basic format. Papers submitted to journals usually include a title page with the name of the paper, the name of the authors, and their credentials. The paper contains an abstract, or a summary of what the paper is about. The abstract allows readers to get a quick look into what the paper is about and helps readers determine if they will continue reading or not. Some journals ask authors to include keywords of the articles after the abstract, while others do not. The introduction, which introduces the hypothesis of the study and gives a background on the research that was performed, comes after the abstract. Following the introduction, there is a materials and methods section that explains all of the procedures performed and the equipment used to complete

them. This section relies heavily on the information from research notebooks because it is important for all experiments to be reproducible. Next is a results section where the authors include all of the data that they collected when experiments were run. The results section also includes any tables or graphs that the author wishes to include. The discussion section explains what the results mean and acts as a conclusion of the paper. Lastly, most scientific papers include an acknowledgement section, a place to mention any sources that funded the paper, and a reference section, a collection of all the texts the author referred to throughout the paper. Usually articles have a lot of references because they show that the data is supported. More sources usually means more reliable work.



Figure 1: *The Journal of Clinical Endocrinology & Metabolism*

To get an accurate understanding of how a journal submission should be formatted, I looked up some real papers in some professional scientific journals. I found “Complete Androgen Insensitivity Syndrome: Long-Term Medical, Surgical, and Psychosexual Outcome” by Dr. Amy Wisniewski, et al. in the journal *The Journal of Clinical Endocrinology & Metabolism*. This paper has the general format most articles have, but when I read it, I thought it was strange that it combined the introduction with the abstract section and that the results section wasn’t separated from the results section. Once I looked at the guidelines for the Journal I realized it was formatted because that is what the journal requires. Journal articles must match a journal’s format exactly, or it will not be published (*Current Genetics: Instructions for Authors*; Helmann).

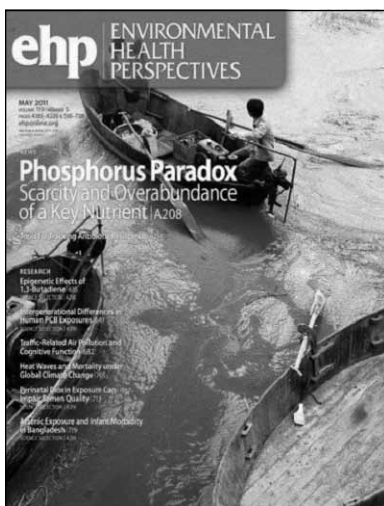


Figure 2: *Environmental Health Perspectives*

I also studied the article “Atrazine-Induced Aromatase Expression is SF-1 Dependent: Implications for Endocrine Disruption in Wildlife and Reproductive Cancers in Humans” (Fan et al., 2007) in *Environmental Health Perspectives* and used it in one of my classes. The paper is formatted so that the results are stated and then explained in a discussion or conclusion section. Separating these two sections is a common characteristic of scientific articles.

Another important aspect of these articles is the form of citation. Most scientific articles are written in MLA or APA format, but some journals have their own format specific to that journal only. Lastly, by investigating these journal articles, I learned that what the paper says is more important than the actual person that performed the research presented in the paper. For that reason, first-person is usually avoided.

Through my investigation, it has become clear to me that most journals are very strict about the papers submitted to them. By setting strict guidelines, journals can ensure they receive only the highest quality of work. Once a manuscript is submitted to a journal, editors check the format and then send the papers to peer editors. The peer editors comment on any corrections that should be made and they also decide if the research discussed in the paper is worth publishing. Once the paper is reviewed, it is sent to researchers to be corrected. Once researchers adjust their papers to meet the journal's requirements, the paper is published. Papers in journals help scientists learn more about their field and create new hypotheses based on new discoveries ("Current Genetics - Instructions for Authors"; Helmann). This process seems stringent, but I now know that if a paper is published in a high quality journal, I can trust the information in that paper.

While scientific journals are important, I have found that journals aren't the only publications I could publish my work in. Many scientists, especially professors, write books. In many cases, professors contribute to writing textbooks for the topics they focus on. I know this because most of the textbooks from my classes were written or contributed to by the professors that taught the classes. A great example of a textbook is called *Vertebrates: Comparative Anatomy, Function, Evolution* by Kenneth Kardong. This book discusses all of the current information about the evolution of vertebrate organisms and it compares all of these organisms to one another. Writing for textbooks can be demanding because science is constantly changing (Shaw). Even if this form of writing is demanding, it is rewarding to have a hand in educating future scientists. If I decide to become a professor, writing for textbooks would be a good outlet for me to share my knowledge of the biology field.

A biologist does not have to work in academia, however; many biologists conduct research at private organizations such as Abbott Laboratories and Baxter. I decided to learn more about these organizations because both of them have locations close to the town I live in. I have grown up passing them every day so I was curious about what type of writing these companies use. Both of these organizations focus on health-related science by researching possible drugs and healthcare equipment. These organizations utilize many forms of writing in order to share their findings and promote new products. One type of publication used is a press release.

A press release allows the organization to tell the media about a new product and what it does. This type of publication is not just meant for people in the scientific field. Press releases are also meant to be read by the general

public with the hope that people will buy the product. A press release will discuss new developments that pertain to a product released by the company. It may introduce a new medicine, warn people of unexpected side effects, or update the public about improvements or changes a company is working on. In addition to press releases, these organizations post supplemental information about their products on their websites.

The screenshot shows a Firefox browser window displaying the Abbott website. The address bar shows the URL: <http://www.abbott.com/news-media/press-releases/2011-sept8.htm>. The page features the Abbott logo and navigation links. The main content area is titled "Press Release" and contains the following text:

Abbott Initiates International ABSORB BTK Clinical Trial for Treatment of Below-the-Knee Critical Limb Ischemia

- › ABSORB™ is Designed to Treat a Patient's Blocked Vessel and Then Dissolve, Leaving the Vessel Free of a Permanent Metallic Implant
- › The ABSORB BTK Trial Highlights Abbott's Commitment to Developing Innovative Technologies to Advance Endovascular Therapy

September 08, 2011

Abbott Park, Illinois (NYSE:ABT) — Abbott today announced the initiation of ABSORB BTK, an international clinical trial evaluating the safety and efficacy of the ABSORB™ bioresorbable vascular scaffold (BVS) for the treatment of below-the-knee (BTK) critical limb ischemia. Critical limb ischemia, a severe form of peripheral artery disease (PAD), occurs when blocked vessels impair blood flow to the lower extremities, which can eventually lead to limb amputation. ABSORB restores blood flow by opening a blocked vessel and providing support to the vessel until the device dissolves within approximately two years. The first patient was enrolled into the ABSORB BTK trial by Marc Bosiers, M.D., head of the Department of Vascular Surgery at St. Blasius Hospital in Dendermonde, Belgium.

"Patients with critical limb ischemia often progress to where they have few options beyond limb amputation, so there is a tremendous need for new therapies to prevent this outcome," said Dierk Scheinert, M.D., Professor of Medicine, the University of Leipzig, Germany, and principal investigator of the ABSORB BTK trial. "The ABSORB device represents the next generation in revascularization therapies that may hold promise for patients with vessel disease in the lower leg. With the ABSORB BTK trial, we will test whether this novel approach – restoring blood flow with a temporary scaffold – has the potential to improve the outcomes of patients with critical limb ischemia."

The ABSORB device is made of polylactide, a proven biocompatible material that is commonly used in medical implants such as dissolvable sutures. Because a permanent metallic implant is not left behind, naturally occurring vessel functions may be restored, which is one of the features that make this device a significant innovation. In January 2011, Abbott announced that ABSORB received CE Mark and is authorized for sale in Europe for the treatment of coronary artery disease. ABSORB currently is under development and is not available for sale in the United States.

ABSORB BTK is a prospective, single-arm, multi-center trial designed to evaluate the safety and efficacy of the ABSORB device in up to 90 patients with below-the-knee critical limb ischemia at up to 10 clinical trial sites in Europe and New Zealand. The primary endpoint is a composite of freedom from major adverse limb events (major amputation, revascularization, or death) within one year of the procedure.

Figure 3: Abbott Press Release

This information is meant for health professionals that are looking for more information about products on the market. These are commercial organizations, so they focus on researching to discover new products and improve upon products, with the goal of making a profit.

Organizations that are non-profit usually use research as a way to find treatments and cures for a disease as well as increase awareness about the illness. One example of this is the American Cancer Society, an organization that raises money to do research on cancer prevention, treatment, and more. The American Cancer Society releases informational texts that include information about cancer prevention, how to find cancer, and how to get treatment. These texts are written so any person can understand them, making them reach a wider audience. Non-profit organizations have different priorities than commercial organizations, but they both release informational texts to help readers, especially those who are not in the biology field.

My investigation into the biology field revealed that although there are many different professions, many professionals rely on the same texts. Professors, advisors, and researchers alike use scientific journals to learn more about their field and tell others what they have learned. Many people may be surprised that science depends so much on writing to communicate new ideas and share information. Biology professionals use writing in order to receive funding through grants, accumulate their research in laboratory notebooks, share their findings in scientific journals, and educate others through textbooks. Without writing, the field of biology could not exist in its current form, and without biology, we would live in a much different world. Learning about the writing genres in the biology field has been very helpful to me as I try to learn more about my future career. This investigation into the genres of biology has given me some mixed emotions. It is intimidating that there are so many guidelines and restrictions on scientific writing. But it is also very exciting to think that the writing I can contribute will help others. Scientific writing is a gateway to learning more and I cannot wait to embark on that journey.

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Alyssa Shapiro is a recent graduate from Illinois State University with a degree in Biology and a minor in Chemistry. She is currently using the knowledge she learned while researching for this paper to find a job in biological research. In her free time she loves doing community service and she belonged to two community service organizations when she attended ISU.